

CPPDR

California Plant Pest & Disease Report

California Department of
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Plant Pest Diagnostics Center
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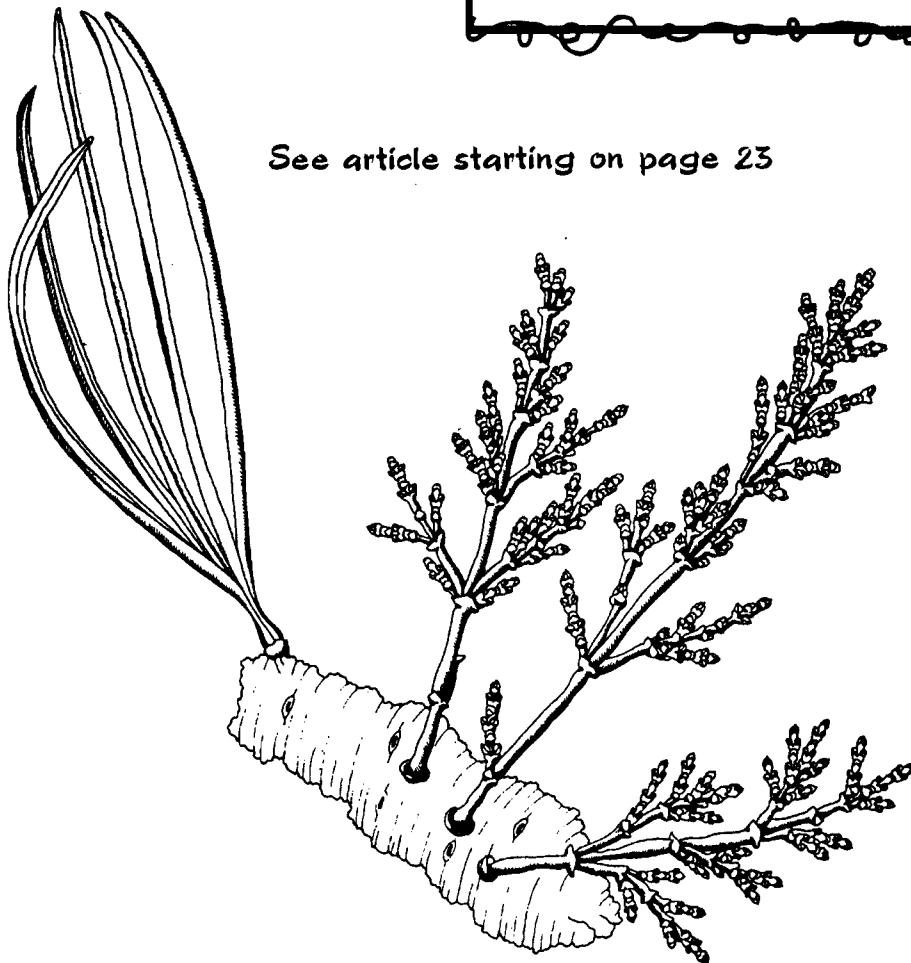
Parasitic Plants of California

What's Inside:

Vol. 15 Numbers 1-2
January-May, 1996

Entomology Highlights.....	3
Significant Finds.....	3
New State Records.....	4
New County Records.....	12
Exclusion.....	13
Border Stations.....	18
Plant Pathology Highlights.....	20
Kernal Bunt Proj. Summary.....	20
Index of Phanerogamic Parasites of California.....	23

See article starting on page 23



Sugar Pine Dwarf Mistletoe



Field Dodder

CALIFORNIA PLANT PEST & DISEASE REPORT

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➔ ENTOMOLOGY HIGHLIGHTS ◀

SIGNIFICANT FINDS

MEXICAN FRUIT FLY, *Anastrepha ludens*, - (A) - Four wild Mexican Fruit Flies were trapped in **San Diego** County during the first part of this year. On January 5, Lewis Funk collected a sexually mature male from a McPhail trap in a sapote tree in National City. Also on January 5, an unmated female with mature eggs was found in a McPhail trap in a tangerine tree by Tim Breuninger in Chula Vista. Kent Ebsen collected a wild, sexually mature male in a McPhail trap in a grapefruit tree in Spring Valley on January 9. And in El Cajon, Joy Murray-Roseberry found a sexually immature, unmated female in a McPhail trap in an orange tree on March 1. In response to these finds, the McPhail trap density has been increased to protocol levels for new Mexican fruit fly finds.

ORIENTAL FRUIT FLY, *Bactrocera dorsalis*, -(A)- There was one Oriental fruit fly found in the first part of 1996. Michael Dishman collected a presumed sexually mature male fly in a Jackson trap in a plum tree on May 23 in Norco, **Riverside** County.

SUCCULENT PIT SCALE, *Asterolecanium stentae*: -(Q)- This scale insect was first noticed in Los Angeles County in 1980, where it occurred on succulents and euphorbias in a hobbyist's garden. Later it was found in the same types of locations in Orange and San Diego Counties. These first finds were all in hobbyist's gardens or in nurseries. However, the scale has now been found firmly established outside of these situations. On January 31, San Diego County Entomologist David Kellum found heavy infestations of this species on *Lantana* in La Mesa, **San Diego** County during a detection survey. The infested plants were associated with city decorative plantings. According to David, the scale can be found in other locations nearby on the same host.

AFRICANIZED HONEY BEE (AHB), *Apis m.* "Africanized," -(A)- The following chart represents Africanized honey bee finds for the first part of 1996:

<u>County</u>	<u>City</u>	<u>Date</u>	<u>Host</u>	<u>Collector</u>
Imperial	Seely	02/05	tree	Inay
Imperial	El Centro	03/01	tree	Inay/Estrada
Imperial	El Centro	03/02	tree	Weathersby
Imperial	El Centro	03/02	tree	Weathersby
Riverside	Blythe	03/07	pipes at prison site	Elms
Imperial	Calipatria	03/11	tree	Hodgkins/Palmera
Imperial	Imperial	04/03	tree	Inay
Riverside	North Shore	04/15	box by a water pipe	Lothrop

ERRATA: The ants, *Pheidole fervens* & *P. meorens*, listed in CPPDR 14 (5-6) were listed as "Q" rated species and should have been listed as "C" rated species.

NEW STATE RECORDS

A THRIPS, *Scirtothrips* sp. -(Q)- This thrips, new to science, to California and the United States, was collected after the time frame of this issue of CPPDR. However, since there is indication that it may be a serious threat to avocados, it will be discussed briefly here. The original collection was made by a pest control advisor and by Mike Dimock, Ventura County Senior Agricultural Inspector at Saticoy, **Ventura** County on June 24 and again on July 8. The thrips was thought to be causing stunting of fruit and possibly a major drop of young fruit. The thrips and its actual damage potential are currently being evaluated by personnel at the University of California, Riverside and U.C. Extension.

The species is undescribed, and is close morphologically to *S. aceri*, native to California, and to *S. abditus*, recently described from Costa Rica and Oaxaca, Mexico. Steve Nakahara, thrips expert at the USDA Systematic Entomology Laboratory in Beltsville, Maryland, has studied the new thrips very carefully and probably will describe it in the near future. Steve has found one specimen of a *Scirtothrips* intercepted in quarantine at San Diego from avocado leaves from Oaxaca, Mexico in 1971. Except for one minor morphological difference, this one specimen is identical to our new thrips. Considering the closeness of the morphology of the new thrips to New World forms, and considering the closeness to the form from avocados in southern Mexico, Steve believes that the species is probably native in that general area of Central America, and is probably associated with the native avocados there.

The morphology of the species will not be covered here since it is new to science, except to say that in the field it appears very similar in size to citrus thrips, *S. citri*, but has dark areas on the thorax and abdomen and therefore appears dusky, rather than bright lemon-yellow as does the citrus thrips.

TWO SPOTTED LEAFHOPPER, *Sophonia rufofascia* -(Q)- This leafhopper was collected nearly simultaneously from several locations in southern California. The actual first collection of established specimens for our records is a collection in a nursery in Commerce, **Los Angeles** County. The collection was made on April 1 by Michael Sium, a Los Angeles County Agricultural Inspector. He found a sizable breeding population on common guava (*Psidium*).

This leafhopper first came to light when California quarantine inspectors began picking it up on plant material arriving from the Hawaiian Islands. At that time it was identified at CDFA as *Pseudonirvana rufofascia*, a species originally described from Guizhou Province, China, by Kuoh and Kuoh, 1976: Acta Entomologica Sinica 26(3): 316-325. In China it is known to feed on *Acacia*, *Citrus* and *Pterocarpus*. Entomologists in Hawaii were unaware at that time that it was established there, and only found it after California notified them that it was being collected from there. In March of this year, Bernarr Kumashiro, Entomologist with the Hawaii Department of Agriculture, was visiting southern California on vacation. While at **San Diego** County at the San Diego zoo, Bernarr noticed suspicious nymphal cast skins and notified us that *S. rufofascia* might be established there. San Diego County Entomologist Dave Kellam was notified and he and State Nursery Services Biologist Crispin Rendon went to the zoo where they observed nymphs and adults of this leafhopper on carrotwood (*Cupaniopsis anacardioides*) and on orange jessamine (*Murraya* sp.).

An earlier collection of this leafhopper was made in Santa Barbara County at a nursery, but this infestation was considered a quarantine matter since the plants had come originally from Hawaii. For more information see the citation in the EXCLUSION section on page 18.

There are some problems with the nomenclature associated with this species. Bernarr Kumashiro has been trying to get confirmation of the original identification from specialists in Asia, where the genus is represented by numerous species. It has been placed both in *Pseudonirvana* and *Sophonia* and recently has been synonymized, possibly incorrectly, with *Nirvana orientalis*. Bernarr is still trying to resolve the synonymy issue and so we will continue to use the name *Sophonia rufofascia* for the time being.

The leafhopper has a fairly wide host range in Hawaii, and it is becoming a serious problem there, especially on some native endemic plants, particularly ferns. See the fact sheet and illustrations of this leafhopper produced by Los Angeles County Entomologist Rosser Garrison on pages 6-7.

A LEAFHOPPER, *Empoasca* species near *guevarai* -(Q)- Orange County Entomologist Nick Nisson collected this leafhopper from his backyard in Tustin, **Orange** County on April 2. This is a new state and county record for this leafhopper. A large number of specimens were taken alive from angel's trumpet, *Brugmansia candida*, in the plant family Solanaceae.

The leafhopper matches *Empoasca guevarai* morphologically according to illustrations in the original species description [Agustín González, 1955: Ann. Inst. Biol. Mexico. 16(1):211-221]. However, two paratype specimens were obtained on loan from the Mexican National Collection at Mexico City for comparison. These two paratypes were both different and neither specimen matched the illustrations of *E. guevarai*. This problem needs to be resolved by obtaining the actual type specimen at a later date.

This leafhopper was described from specimens collected in 1954 from *Phaseolus vulgaris* at Jaloxtoc, Morelos, Mexico. The species has apparently never been recollected and identified. Its economic potential is unknown, however, its large populations on the host in Orange County and its association with beans and tomato relatives indicates that it could cause severe hopperburn injury on vegetable crops.

A PSYLLID, *Heteropsylla* species near *flexuosa* -(Q)- This psyllid was collected in Brea, **Orange** County on May 14, by Orange County Plant Pathologist Richard Tiffer. Adults and nymphs were taken from *Acacia smallii*. This is a new State and County record. It was collected once more within the county, by Nick Nisson in San Juan Capistrano. The subsequent collection was also taken off of *Acacia smallii*. A sample of the specimens was sent to Ian Hodkinson, a specialist in the United Kingdom, for a determination of the species.

A ROOT MEALYBUG, *Rhizoecus arabis* -(Q)- This soil inhabiting mealybug was collected from the roots of orchids and African violets grown by a home owner and plant fancier in Cupertino, Santa Clara County. The collections were made by Stan Maggi of the Agricultural Commissioner's office. This is a new state and county record. The mealybug also occurs in Florida, where it was collected in 1982 from a botanical garden in Sarasota. It is also known from Colombia, South America and Costa Rica in Central America.

LOS ANGELES COUNTY

AGRICULTURAL COMMISSIONER'S OFFICE

New Agricultural Pest for Southern California

Two Spotted Leafhopper (*Sophonia rufofascia*) (Fig. 1, 2)

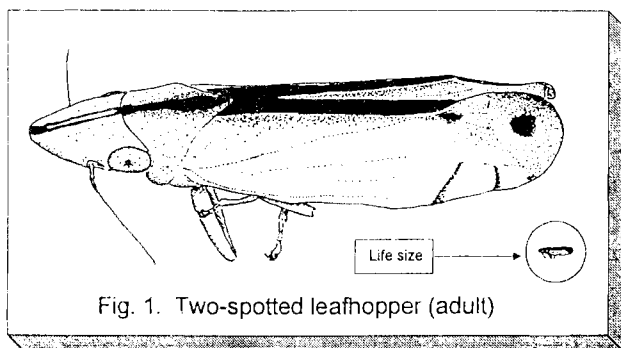


Fig. 1. Two-spotted leafhopper (adult)

Introduction: A resident, breeding population of the **Two Spotted leafhopper** (*Sophonia rufofascia*) was found for the first time in the continental United States. Los Angeles County Agricultural Inspector Michael Sium is credited with finding larvae and adults breeding on 15 gallon potted guava plants in a nursery in the City of Commerce on 1 April 1996. Inspector Sium reported

seeing larvae and adults feeding on the underside of the leaves.

On 11 April 1996, Los Angeles County Agricultural Entomologist Rosser Garrison, Supervisory inspector Dan Papilli, and Michael Sium went to the collection site to see this species. They observed it to be common; adults were flushed from the underside of leaves of the host plant. During times of sunshine, these insects were active and jumped at the slightest provocation. Larvae were less evident, but their smaller size and green coloration probably caused them to escape detection.

Like other leafhoppers, this species may be expected to have deleterious effects on their host plants due to the sucking activities by adults and larvae. Large populations might adversely affect certain ornamental and fruit crops (see under **Comments**).

Identification: The adult (Fig. 1) is approximately 5 mm long, primarily light green or pale yellow, and has a bold black longitudinal stripe down the center of its body. A black spot occurs at the tip of the fore wing. A beautiful red or pink flush of varying degrees borders the black dorsal stripe. Larvae (Fig. 2) are smaller, all green, and have a pair of small black spots at the tail end of the abdomen (hence the common name, Two Spotted leafhopper). Both adults and larvae are easily separated from any other species in our area by the combination of characters given above.

Life History: Nothing is recorded of the life history of this recently described species, although its development will probably be similar to other species of tropical leafhoppers. In the mild, year-round climate in the Los Angeles area, this species will probably be found to breed year-round.

Comments: This leafhopper was collected on Camellia and described from Guizhou, People's Republic of China in 1983. Larvae were beginning to be found on cut flower shipments to

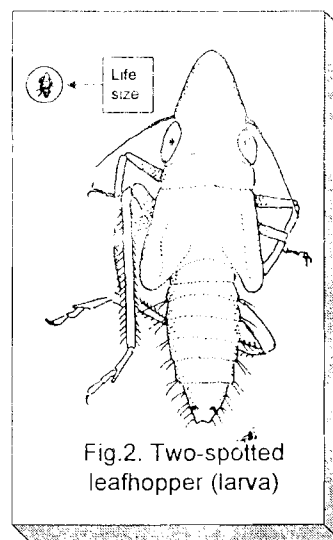


Fig. 2. Two-spotted leafhopper (larva)

California from Hawaii about ten years ago, although its specific identity was not yet known. Once adults were collected, Ray Gill, Systematic Entomologist at the California Department of Food and Agriculture in Sacramento was able to identify the species. Although rated "Q", there is no literature on its biology or known host plants. Dr. Alexander Purcell, Entomologist at the University of California, Berkeley has observed this newly introduced species in Hawaii. It has rapidly spread throughout Hawaii and has an immense host range.. In recent e-mail correspondence to Garrison, he states that the feeding activity of the leafhopper is toxic to many cultivated plants including guava. It is also threatening the survival of many Hawaiian native plants some of which are important for watersheds and the survival of interdependant organisms. Its impact in Southern California is unknown but it will probably spread throughout the coastal areas of the southern California Counties. This species is almost certainly established and will probably spread to other areas wherever its host plant(s) occur.

continued from page 5

Besides the hosts listed above for California, it has also been collected from the following: *Coffea arabica*, undetermined Poaceae, *Allopectus cucullatus*, *Gasteranthus acropodus*, *G. atratus*, *G. dressleri*, *G. corallinus*, *G. maculatus*, *Monopyle grandiflora*, *M. paniculata* and *Nautilocalyx punctatus*.

A SNAIL, *Xerotrachia conspurcata* -(Q)- During an agricultural quarantine inspection of imported, crated slate rock in San Pablo, **Contra Costa** County, the first recorded collection of this snail was made by Richard Wion on January 23. This is a new state and county record. After this find, a survey was conducted at and around this and other locations where the slate was being shipped. As a result the following collections were made: in **San Mateo** County Steve Olmsted collected a live adult of this snail on the slate on February 15 in Brisbane (a new county record), in a landfill in Colma on February 26, and under lumber in So. San Francisco on February 27; Tony Haro collected it in San Mateo on February 15 on dead branches of *Eucalyptus* sp. (also a county record) and on February 28 from dead wood in a yard in Redwood City; in **Alameda** County, Estep collected this species on chipped wood and on the ground at a recycling yard in Hayward on February 20 (new county record); ; in Petaluma, **Sonoma** County, Estep collected live adults on soil in a landscape materials yard on March 8 (new county record); and also in **Contra Costa** county, Steve Olmstead found the snail under cardboard at the Richmond Terminal, R3, in Richmond on March 6 and also collected it in Dublin under cardboard at a building supply on March 12.

The following information on the snail was compiled by USDA personnel:

TAXONOMY:

Phylum:	Mollusca
Class:	Gastropoda
Subclass:	Pulmonata
Order:	Stylommatophora
Family:	Helicidae
Subfamily:	Helicellinae
Full Name:	<i>Xerotrachia (Helicella) conspurcata</i> (Draparnaud, 1801)
Synonyms:	<i>Helicella conspurcata</i>

US DETECTION DATA AND/OR DISTRIBUTION MAP:

Initial Detection in US:

Location:	San Pablo, CA (Contra Costa County)
Date:	23 Jan 96 (perhaps earlier)
Host:	(No host specified; moved from yard of importer to adjacent field)
Collector:	Richard Wion, CA Department of Food and Agriculture
Identifier:	Division of Plant Industry CA Department of Food and Agriculture Sacramento, CA
Iden. Date:	1996 (by CA Department of Food and Agriculture)

QUARANTINES:

In the course of a single year, July, 1968 to June, 1969, *Helicella conspurcata* was among the snails intercepted in cargo (Godan, 1983). Godan (1983; pg 282) included *Helicella* sp. in a list of quarantine snails of special importance.

According to Dundee (1974), several species of *Helicella* have been introduced into Eastern North America: *Helicella caperata*, *Helicella elegans*, and *Helicella striata*.

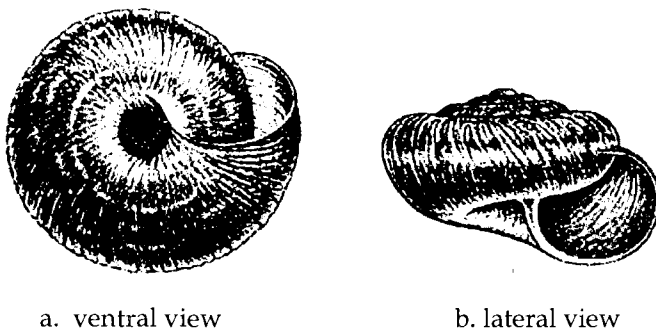
This snail appears, as *Helicella conspurcata*, in a 1960 listing of snails and slugs of quarantine significance to the United States (Agricultural Research Service, 1960).

LIFE HISTORY:

Egg Stage: After mating, snails lay eggs, usually in clutches in small holes in the soil, or in cracks in rotting wood, or under logs and stones. The number of eggs in a clutch varies greatly, often 20-50 in larger species, but sometimes 100 or more. The rate of development depends on temperature, but most eggs hatch within 6 weeks. More than one clutch may be laid in a season (Kerney & Cameron, 1979).

Pre-adult Stage: Newly hatched young are like very miniature adults. Their development is direct, without metamorphosis or molting. The young grow by adding material to the leading edge of the shell, adding more whorls as they grow. Most species reach maturity in a year. The pre-adults are covered with fine, slightly curved hairs, usually worn off in adults (Kerney & Cameron, 1979).

Adult Stage: Gastropods are hermaphrodites. In the pulmonates, the spermatozoa mature before the egg cells. In the first phase, the gonad is not developed. In the second phase, the gonad produces spermatozoa. In this phase, spermatozoa is transferred to the seminal receptacle of another snail. In the third phase, the gonad releases eggs. Most pest gastropods are autosterile (Godan, 1983; pg 346). In small species, most adults die soon after breeding, so that the life-span is little more than a year. Some may survive a second season (Kerney & Cameron, 1979).



Description: 3-5 x 5-8 mm.. Shell depressed above, convex below, with a low conical spine of 5-6 whorls with moderate sutures, slightly shouldered at the periphery. Umbilicus small and circular. Mouth oval, lacking internal rib. Shell opaque brown, sometimes whitish, flecked with white, and sometimes with faint darker spiral bands. Transverse ribbing marked and slightly irregular. Immatures are hairy.

Fig. 1. *Xerotrícia conspurcata*. Illustration taken from Kerney & Cameron, 1979; A Field Guide to the Land Snails of Britain and North-west Europe, William Collins Sons & Co., Ltd., 288 pp.

"HOSTS":

Specimens were collected in a shipment of rosemary (*Rosmarinus officinalis*) seed (Roth & Kennedy, 1973).

DISTRIBUTION:

Europe:	W. Mediterranean (Kerney & Cameron, 1979) Greece (Frank, 1983), possibly Cyprus (Gittenberger, 1991) Found in Mediterranean Region of France, not northern France.
Africa:	(?)
N. Amer.:	U.S.A. (Introduced: CA)

DAMAGE WHERE ESTABLISHED:

Byas (1972) considered this species to be "injurious" but gave no information on damage. Kerney and Cameron (1979) state that this is "a common Mediterranean species."

PERTINENT POINTS/PREDICTED CONSEQUENCES:

Te (1976) considers the Family Helicidae to have generally a Western Palaearctic distribution.

Of the 16 species in the Subfamily Helicellinae, most are typically found in dry, open habitats such as dunes, open grassland, and rocky hillsides. However, two species, *Helicella conspurcata* and *H. apicina*, live in damper and shadier habitats. *Helicella conspurcata* is found under stones and on trees and logs, in relatively shady places (Kerney & Cameron, 1979).

Other species in the Genus *Helicella* are pests. For example, Van Dinther (1973) lists *Helicella candidans* as a commonly reported pest species. Byas lists a number of *Helicella* species as "injurious."

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A SNAIL, Polygyridae sp. -(Q)- Snail samples found during a blitz of a slate-importing firm in the Bay Area were found to be "Q" rated, possibly Polygyridae (PDR# 1059527 dated 10/31/95). The crates containing these snails were due to be fumigated on 11/28/95. They were unable to be fumigated due to their proximity to a produce market.

On Monday, November 27th, while the crates were being moved to a site on the property suitable for fumigation, it was found that a large number of these snails, several hundred, exist not only under the pallets being moved but also on the two adjacent rows as well as ten feet into the field behind the company yard and behind the produce market adjacent to the property.

NEW COUNTY RECORDS

AUSTRALIAN GUM TREE WEEVIL, *Gonipterus scutellatus* -(Q)- Rosser Garrison, Los Angeles County Entomologist, collected adults of this species on *Eucalyptus globulus* in Malibu, **Los Angeles** County, which is a first for this county. This weevil was found during a detection survey on January 18. The species was first detected in North America in **Ventura** County in March of 1994. See CPPDR 13(1-2):4-7.

HARPER SCALE, *Neopinnaspis harperi* -(B)- This scale was collected in Fountain Valley, **Orange** County, for the first time on May 1, making it a new county record. P. Valenzuela found live and dead adults on *Quercus ilex* during a routine detection survey. The identification was determined by Nick Nisson and confirmed at the PPDC in Sacramento. This species was first detected in California at Montecito, **Santa Barbara** County in 1949. At that time the species was unknown to science and was described by Howard McKenzie in that year. The species was named for Bob Harper, chief of the Bureau of Entomology at that time.

The scale has only been recollected once since the original find. Joe Karl, of the Santa Barbara County Agricultural Commissioner's Office, collected it near the Santa Barbara Museum of Natural History in 1979. The Orange County find is a considerable range extension. The scale may be more widespread than previously thought, because it is very small and blends in so well with the host bark that it is easily overlooked.

A TREEHOPPER, *Idioderma* sp. -(Q)- This treehopper has been found for the first time in Riverside, **Riverside** County. Adults of this species were collected from leaves of fan palm, *Washingtonia* sp. by Eldon Reeves at the county administrative center in Riverside, during a detection survey on September 25. This species was first detected in California in San Bernardino in 1988, where it was causing honeydew problems at a hotel parking lot. It was feeding on the flower spaths of Mexican fan palm, *Washingtonia robusta*. The Riverside County infestation was on small, immature trees and the exact species of *Washingtonia* is unknown at this time. This treehopper is an undescribed species, possibly native to Mexico, where the fan palm is native. For more information on the original California find see CPPDR, 1988: 7(1-4):16.

ASH PSYLLID, *Psyllopsis fraxinicola* -(C)- Adults and nymphs of this psyllid were collected on raywood ash by Michael Stewart, Supervising Agricultural Biologist, in Biggs, **Butte** County on May 14, and by Jim Xerogeanes, Agricultural Inspector, also on raywood ash at Talmage, **Mendocino** County, on May 23. For more information on the ash psyllid, please see CPPDR 6(1-2): 9-10.

HAIRY MAGGOT BLOWFLY, *Chrysomya rufifacies* -(Q)- Norm Smith, Fresno County Entomologist, found adults, larvae and pupae of this species on a dead rabbit in Sanger, **Fresno** County. The collection is a new county record and was made on December 1, during a residential detection survey. It was previously known from **Los Angeles**, **Orange** and **San Diego** Counties. For more information on the hairy maggot blowfly, refer to the citation in CPPDR 7(1-4): 13-14.

PERSEA MITE, *Oligonychus perseae*: -(Q)- This mite was collected for the first time in **San Luis Obispo** County on January 10. Mary Bianchi, with U.C. Cooperative Extension, found adults on leaves of *Persea americana* during a survey of an orchard in San Luis Obispo. This troublesome pest species was first detected in San Diego County in 1992. Since that time it has become generally distributed and troublesome in San Diego, Orange, Los Angeles, Ventura and Santa Barbara counties. For more information

TWO SPOTTED LEAFHOPPER, *Sophonia rufofascia* -(Q)- Please see citation under new state records on page 4 of this issue.

A LEAFHOPPER, *Empoasca guevarai* -(Q)- Please see citation under new state records on page 5 of this issue.

A PSYLLID, *Heteropsylla* sp. near *flexusoa* -(Q)- Please see citation under new state records on page 5 of this issue.

A SNAIL, *Xerotrichia conspurcata* -(Q)- Please see citation under new state records on page 8 of this issue.

EXCLUSION

The following "A", "B", & "Q" rated insects and those at the top of page 18 have been found infesting nursery stock or in other quarantine situations in California during the last part of 1995 and the first part of 1996. The pest listed on pages 14-17 were intercepted in quarantine.

GREEN SHIELD SCALE, *Pulvinaria psidii*, -(A)- This scale was found on three occasions in two nurseries in **Los Angeles** County. The first in Rosemead by Dan Papilli on October 24 and the second and third in Monterey Park by Dan Papilli and Mike Sium, respectively, both on October 31. The finds of these adult scales were made on several hosts including: *Ficus* sp., *Schinus* sp. and *Ficus benjamina*. James Wynn collected adults, nymphs, and egg masses of this same species on *Citrus sinensis* in a nursery in Brea, **Orange** County on February 15.

HERCULEANA SCALE, *Clavaspis herculeana*, -(A)- Lorenzo Fernandez found this adult scale on *Ficus benjamina* at a nursery in Costa Mesa, **Orange** County on January 22.

MAGNOLIA WHITE SCALE, *Pseudaulacaspis cockerelli*, -(A)- Mohammad Marashi collected live adult specimens of this species on *Strelitzia* sp. in a nursery in Gardena, **Los Angeles** County. The collection was made on February 1. On February 5, Suzanne Squires also found adults of this species in a nursery in Santa Barbara, **Santa Barbara** County on *Phoenix roebelenii*.

PYRIFORM SCALE, *Protopulvinaria pyriformis*, -(B)- This species was collected off of *Laurus nobilis* in a nursery in Linden, **San Joaquin** County by Art Moretto. The collection was made on February 7.

"A", "B", and "Q" Rated Arthropods and Mollusks Intercepted in Quarantine
August 1995 - December 1995

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
Q	<i>Palmivultus palmarum</i>	palm mealybug	09/26/95	Hawaii	ORA	<i>Neodiplosis decaryi</i>	Wynn
Q	<i>Tetranychus gloveri</i>	a tetranychid mite	09/29/95	Florida	SJQ	<i>Schefflera arboricola</i>	Watkins
Q	<i>Philephedra tuberculosa</i>	a soft scale	10/03/95	Costa Rica	SJQ	croton banana	Moretto
B	<i>Pseudococcus eliae</i>	elias mealybug	10/03/95	Costa Rica	SJQ	<i>Aglaonema</i> sp.	Moretto
Q	<i>Sophonia rufifascia</i>	a leafhopper	10/06/95	Hawaii	CCA	bird of paradise/TI	Maddux
Q	<i>Oceanaspilothus araucariae</i>	an armored scale	10/23/95	Hawaii	ORA	<i>Araucaria heterophylla</i>	Mehraban
Q	<i>Laminicoccus pandani</i>	pandanus mealybug	10/30/95	Hawaii	SMF	<i>Pandanus</i> sp.	Loux
Q	<i>Diaphania nitidalis</i>	pickworm	10/31/95	Florida	SCL	<i>Cucumis sativus</i>	Loux
Q	<i>Coccus acutissimus</i>	slender soft scale	11/15/95	Hawaii	LAX	<i>Cycas revoluta</i>	Matsumoto
Q	<i>Geococcus coffeae</i>	a soil mealybug	11/15/95	Hawaii	ORA	<i>Rhapis</i> sp.	Fernandez
Q	<i>Hylurgus ligniperda</i>	a bark beetle	11/16/95	New Zealand	SFO	<i>Pinus radiata</i>	Condos
Q	<i>Morganella longispina</i>	plumose scale	11/20/95	Florida	ORA	<i>Ficus benjamina</i>	Fernandez
Q	<i>Merochanus alternatus</i>	a longhorned beetle	11/27/95	China	SFO	crates	Estep
Q	<i>Kawanaspis hikosani</i>	a bamboo diaspidid scale	11/28/95	Florida	ORA	<i>Curtis</i> sp.	Bennett
Q	<i>Aleurocalus anthuricola</i>	anthurium whitefly	11/29/95	Hawaii	SLO	<i>Anthurium</i> sp.	Little
Q	<i>Amorbia</i> sp.	a leafroller	11/29/95	Mexico	SFO	<i>Rubus</i> sp.	Pyle
Q	<i>Anoplolepis longipes</i>	long-legged ant	11/29/95	Hawaii	SLO	<i>Anthurium</i> sp.	Little
A	<i>Pinnaspis srachani</i>	lesser snow scale	11/29/95	Costa Rica	SJQ	<i>Dracaena marginata</i>	Williamson
Q	<i>Pseudanida euflex</i>	camphor scale	11/29/95	Florida	ORA	<i>Ficus benjamina</i>	Fernandez
Q	<i>Coptosoma xanthogramma</i>	black stink bug	11/30/95	Hawaii	LAX	automobile	Jackson
Q	<i>Cryptoblabes aliena</i>	a phycitine pyralid moth	11/30/95	Hawaii	LAX	automobile	Jackson
B	<i>Dasineura balsamicola</i>	balsam fir gall midge	11/30/96	Maine	MEN	<i>Abies balsamea</i>	Hajik
A	<i>Diaprepes</i> sp.	a weevil	11/30/95	---	SCL	---	Nachand
B	<i>Paradiplosis tumifex</i>	balsam gall midge	11/30/96	Maine	MEN	<i>Abies balsamea</i>	Hajik
Q	<i>Calliphora stygia</i>	an exotic blowfly	12/05/95	New Zealand	LAX	<i>Persea americana</i>	Dayyani
A	<i>Aspidiotus destructor</i>	coconut scale	12/06/95	Costa Rica	SFO	<i>Musa</i> sp.	Kawakami
B	<i>Dasineura balsamicola</i>	balsam fir gall midge	12/06/95	Maine	MEN	<i>Abies balsamea</i>	Hajik
Q	<i>Neonocephalus</i> sp.	a katydid	12/06/95	Mexico	LAX	ship	Nawal
Q	<i>Pinnaspis uniloba</i>	unilobed scale	12/08/95	Hawaii	ALA	<i>Alyxia loutiaeformis</i>	Peek
A	<i>Selenaspis articulatus</i>	rufous scale	12/08/95	Ecuador	LAX	<i>Zingiber</i> sp.	Awad
Q	<i>Sophonia rufifascia</i>	two spotted leafhopper	12/08/96	Hawaii	LAX	<i>Cordyline terminalis</i>	Awad
A	<i>Bactrocera latifrons</i>	Malaysian fruit fly	12/11/95	---	ALA	building	Condos
Q	<i>Coccus acutissimus</i>	slender soft scale	12/11/95	Florida	ORA	<i>Dimocarpus longan</i>	Nestor

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
Q	<i>Ceroplastes floridensis</i>	Florida wax scale	12/11/95	Florida	ORA	<i>Dimocarpus longan</i>	Fernandez
A	<i>Aspidiotus destructor</i>	coconut scale	12/13/95	Florida	SJQ	areca palm	Moretto
A	<i>Aspidiotus destructor</i>	coconut scale	12/13/95	Florida	SJQ	areca palm	Williamson
Q	<i>Ceratiaphis</i> sp.	an aphid	12/14/95	Hawaii	SFO	leaf	Sohal
B	<i>Dasineura balsamicola</i>	balsam fir gall midge	12/14/95	Minnesota	MEN	<i>Abies</i> sp.	Hajik
B	<i>Paradiplois tumifex</i>	balsam gall midge	12/14/95	Minnesota	MEN	<i>Abies</i> sp.	Hajik
A	<i>Aspidiotus destructor</i>	coconut scale	12/15/95	Ecuador	LAX	<i>Musa</i> sp.	Nawal
B	<i>Paradiplois tumifex</i>	balsam gall midge	12/18/95	Minnesota	MEN	<i>Abies</i> sp.	Hajik
Q	<i>Elixothrips brevisetis</i>	a shefflera thrips	12/21/95	Hawaii	SLO	<i>Schefflera arboricola</i>	Schmitz
Q	<i>Coptosoma xanthogramma</i>	black stink bug	12/28/95	Hawaii	SFO	lei	Olmstead
Q	<i>Chrysodeixis eriosoma</i>	green garden looper	01/03/96	Hawaii	SCL	hunkay (mint)	Nachand
A	<i>Selenaspides articulatus</i>	rufous scale	01/04/96	Ecuador	LAX	areca palm	Awad
A	<i>Aspidiotus destructor</i>	coconut scale	01/05/96	Costa Rica	LAX	<i>Musa</i> sp.	Kawakami
Q	<i>Aspidiotus excisus</i>	aglaonema scale	01/05/96	Florida	SJQ	<i>Aglaonema</i> sp.	Lansigan
Q	<i>Pseudonidia trilobitiformis</i>	trilobe scale	01/08/96	Florida	SJQ	<i>Ficus benjamina</i>	Lansigan
Q	<i>Hemiberlesia ocellata</i>	an armored scale	01/09/96	Ecuador	LAX	<i>Musa</i> sp.	Nawal
B	<i>Dysmicoccus alazon</i>	alazon mealybug	01/10/96	Mexico	SFO	<i>Alpinia</i> sp.	Merrill
B	<i>Ferrisia virgata</i>	striped mealybug	01/10/96	Mexico	SFO	<i>Alpinia</i> sp.	Merrill
B	<i>Nezara viridula</i>	southern green stink bug	01/11/96	Hawaii	SFO	malungai	Lino
B	<i>Diaphania nitidalis</i>	pickleworm	01/16/96	Dom. Rep.	SMT	<i>Cucumis sativus</i>	Loux
Q	<i>Dysdercus</i> sp.	a stainer	01/16/96	Ecuador	LAX	<i>Musa</i> sp.	Nawal
Q	<i>Sybra alternans</i>	a longhorned beetle	01/18/96	Hawaii	LAX	chinese cilantro	Bakri
B	<i>Diaphania nitidalis</i>	pickleworm	01/19/96	Dom. Rep.	SMT	<i>Cucumis sativus</i>	Loux
Q	<i>Morganella longispina</i>	plumose scale	01/22/96	Florida	ORA	<i>Ficus benjamina</i>	Fernandez
B	<i>Diaphania nitidalis</i>	pickleworm	01/24/96	Dom. Rep.	SMT	<i>Cucumis sativus</i>	Loux
A	<i>Selenaspides articulatus</i>	rufous scale	01/26/96	Ecuador	LAX	areca palm	Awad
A	<i>Selenaspides articulatus</i>	rufous scale	01/30/96	Costa Rica	SFO	<i>Citrus aurantifolia</i>	Sohal
Q	<i>Aonidiella orientalis</i>	oriental scale	02/05/96	Florida	ORA	<i>Sirelitzia</i> sp.	Wynn
Q	<i>Hemiberlesia diffinis</i>	diffinis scale	02/05/96	Florida	ORA	<i>Ficus benjamina</i>	Fernandez
Q	<i>Morganella longispina</i>	plumose scale	02/05/96	Florida	ORA	<i>Ficus benjamina</i>	Wynn
Q	<i>Sybra alternans</i>	a longhorned beetle	02/05/96	Hawaii	SCL	baha	Nachand
A	<i>Hemiberlesia palmae</i>	tropical palm scale	02/06/96	Ecuador	LAX	<i>Musa x paradisiaca</i>	Nawal
Q	<i>Chrysodeixis eriosoma</i>	green garden looper	02/07/96	Hawaii	SCL	salayut	Nachand

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
B	<i>Diaphania nitidalis</i>	pickleworm	02/08/96	Dom. Rep.	SMT	<i>Cucumis sativus</i>	Loux
Q	<i>Chrysodeixis eriosoma</i>	green garden looper	02/09/96	Hawaii	ORA	ti/foilage	Kinsella
Q	<i>Geotomus pygmaeus</i>	a burrowing bug	02/09/96	Hawaii	KRN	<i>Zingiber</i> sp.	Lapp
Q	<i>Oceanides</i> sp.	a lygaeid bug	02/10/96	Hawaii	LAX	<i>Zingiber</i> sp.	Awad
Q	<i>Oxydema longula</i>	a weevil	02/19/96	Hawaii	SMT	cut flowers	Loux
Q	<i>Hemiberlesia ocellata</i>	an armored scale	02/20/96	Ecuador	LAX	<i>Musa</i> sp.	Kawakami
Q	<i>Paracarsidara dugesii</i>	a psyllid	02/21/96	Mexico	LAX	<i>Ocimum</i> sp.	Kawakami
A	<i>Clavaspis herculeana</i>	herculeana scale	02/26/96	Hawaii	ORA	<i>Plumeria</i> sp.	Nestor
A	<i>Hemiberlesia palmarum</i>	tropical palm scale	02/27/96	Hawaii	ORA	bromeliads	Fernandez
Q	<i>Sophonia rufofascia</i>	two spotted leafhopper	02/27/96	Hawaii	ORA	<i>Dracaena draco</i>	Wynn
Q	<i>Orchidophilus</i> sp.	a weevil	02/29/96	Hawaii	LAX	orchids	Ruse
Q	<i>Chlorogonalia ultima</i>	a sharpshooter	03/04/96	Ecuador	LAX	<i>Ananas comosus</i>	Kawakami
Q	<i>Rhizococcus hibisci</i>	a root mealybug	03/04/96	Florida	LAX	<i>Syracus romanzoffiana</i>	Banta
Q	<i>Rhizococcus hibisci</i>	a root mealybug	03/05/96	Florida	LAX	<i>Ravenea rivularis</i>	Banta/Calicchia
Q	<i>Helicoverpa hawaiiensis</i>	Hawaiian budmoth	03/06/96	Hawaii	LAX	automobile	Rabe
B	<i>Opeas</i> sp.	a snail	03/06/96	Florida	LAX	<i>Ravenea vivularia</i>	Wegener
Q	<i>Rhizococcus hibisci</i>	a root mealybug	03/06/96	Florida	LAX	<i>Ravenea rivularis</i>	Calicchia
Q	<i>Rhizococcus hibisci</i>	a root mealybug	03/06/96	Florida	LAX	<i>Ravenea vivularia</i>	Wegener
B	<i>Nezara viridula</i>	southern green stink bug	03/11/96	Hawaii	SCR	<i>Ocimum</i> sp.	Perry
Q	<i>Aleurocerus palmarum</i>	palm whitefly	03/12/96	Florida	SAC	---	Dixon
Q	<i>Zachrysia provisoria</i>	a snail	03/12/96	Florida	SCL	<i>Spathiphyllum</i> sp.	Nachand
Q	<i>Coccus viridis</i>	green scale	03/13/96	Hawaii	SBA	<i>Plumeria</i> sp.	Squires
Q	<i>Achaea janata</i>	a noctuid moth	03/15/96	Hawaii	SFO	<i>Ocimum</i> sp.	Lino
Q	<i>Coccus acutissimus</i>	slender soft scale	03/20/96	Hawaii	LAX	<i>Cycas</i> sp.	Hamashita
Q	<i>Aracerus</i> sp.	a bean weevil	03/26/96	Ecuador	LAX	<i>Musa</i> sp.	Nawal
Q	<i>Philephedra tuberculosa</i>	a soft scale	04/03/96	Florida	SMT	<i>Spathiphyllum</i> sp.	Garcia
A	<i>Ceroplastes rubens</i>	red wax scale	04/04/96	Florida	LAX	<i>Euphorbia longana</i>	Awad
Q	<i>Adoretus sinicus</i>	Chinese rose beetle	04/05/96	Hawaii	SCR	<i>Ocimum</i> sp.	Kovarik
Q	<i>Dysmicoccus mackenziei</i>	McKenzie mealybug	04/05/96	Hawaii	MAD	<i>Tillandsia capit</i>	Rohn
B	<i>Parlatoria pergandii</i>	chaff scale	04/09/96	Taiwan	SFO	<i>Citrus sinensis</i>	Condos
Q	<i>Philephedra tuberculosa</i>	a soft scale	04/09/96	Florida	SMT	<i>Spathiphyllum</i> sp.	Kuwahara
Q	<i>Dysmicoccus</i> sp.	a mealybug	04/11/96	Mexico	ORA	<i>Alpinia purpurata</i>	Gibbs
Q	<i>Gyponana germari</i>	a leafhopper	04/11/96	Hawaii	ORA	<i>Heliconia</i> sp.	Gibbs

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
A	<i>Selenaspidus articulatus</i>	rufous scale	04/11/96	Ecuador	LAX	<i>Zingiber</i> sp.	Awad
A.	<i>Aspidiotus destructor</i>	coconut scale	04/12/96	Cent. America	LAX	<i>Musa</i> sp.	Dayyani
Q	<i>Asterolecanium pustulans</i>	pustule scale	04/18/96	Florida	ORA	molix	Wynn
Q	<i>Dysmicoccus</i> sp.	a mealybug	04/23/96	Mexico	SFO	---	Tome
Q	<i>Sophonia rufofascia</i>	a leafhopper	04/23/96	Hawaii	SBA	<i>Codyline terminalis</i>	Squires
Q	<i>Hylurgus lingiperda</i>	a bark beetle	04/29/96	New Zealand	SFO	lumber (green)	Wion
Q	<i>Dysmicoccus</i> sp.	a mealybug	05/03/96	Mexico	ORA	<i>Alpinia purpurata</i>	Gibbs
Q	<i>Thrips hawaiiensis</i>	Hawaiian flower thrips	05/09/96	Hawaii	SLO	orchids	Focha
Q	<i>Aleurotulus anthuricola</i>	anthurium whitefly	05/11/96	Hawaii	SLO	<i>Anthurium</i> sp.	Focha
Q	<i>Chrysodeixis eriosoma</i>	green garden looper	05/11/96	Hawaii	SLO	---	Focha
Q	<i>Sophonia rufofascia</i>	two spotted leafhopper	05/11/96	Hawaii	SLO	tropical foliage	Focha
B	<i>Lamellaxis</i> sp.	a snail	05/13/96	Florida	ORA	<i>Schefflera arboricola</i>	Park
Q	<i>Dysmicoccus</i> sp.	a mealybug	05/26/96	Mexico	ORA	<i>Alpinia purpurata</i>	Gibbs

McKENZIE MEALYBUG, *Dysmicoccus mackenziei*, -(Q)- Dead adults of this mealybug were collected from a shipment of *Tillandsia caput* to a nursery in Coursegold, **Madera** County on April 5 by Bruce Rohn. This mealybug is commonly encountered on imported tillandsias.

TWO SPOTTED LEAFHOPPER, *Sophonia rufofascia*, -(Q)- Live adults, nymphs, and eggs of this leafhopper were found by Suzanne Squires on February 29, in Carpinteria, **Santa Barbara** County. The infested host, *Phoenix roebelenii*, was treated at the nursery. The plants had originated in Hawaii and this species is frequently received on plant material from there. This leafhopper now appears to be established in the state, see citation under New State Records.

COFFEE BEAN WEEVIL, *Araecerus fasciculatus* -(Q)- This weevil species has been found for the first time in **Los Angeles** County, on October 3. Cardenas collected a single live adult in Los Angeles on *Prunus persica*. Since the collection was a single find, it is not known whether this insect is actually established here, therefore the find is being considered an Exclusion incident for the time being.

BORDER STATIONS

The following interceptions were made at border stations during the latter part of 1995 and the first few months of 1996.

UNDESCRIBED WEEVIL - On September 16, 1995, at the Blythe border station, Steve Klingemeier intercepted a fruit native to Mexico called papache, *Randia echinocarpa*, from a licensed Mexican auto on its way to Los Angeles. Several live adult weevils from the subfamily Zygopinae were found when the fruit was cut open. This is not only an undescribed species, but possibly also an undescribed genus.

ZEBRA MUSSEL, *Dreissena polymorpha* - On February 3, adults of this species were found by Bill Gresick, at Vidal, on the hull of a boat on its way to Cupertino, making it the seventh confirmed zebra muscle interception at border stations. The eighth was found in Yermo, on the drive shaft of a boat, on April 5, by Alex Mesa. The boat was on its way to Ventura. Both of these boats were returning from trips to Lake Michigan.

CITRUS PEEL MINER, *Marmara* sp. - An unusually large number of larvae of this species have been collected at the border stations between December, 1995 and May, 1996. A total of 718 interception were made. The hosts of homegrown and commercially grown fruit included grapefruit, oranges, lemons, tangerines, and tangelos. These fruits had various origins including: Arizona, California, Colorado, Florida, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, as well as Canada and Mexico.

GRACILLARIID MOTH, probably *Marmara* sp. - Steve Klingemeier found larvae of this species tunneling under the skins of uncertified mangoes in a commercial shipment from Nicaragua. The interception was made on March 20, at the Blythe border station. This is the

same genus but a different species than the miner that attacks citrus fruit. This is the first recorded collection of this species at a California border station.

ANIMAL PESTS - In December, 1995 the following significant interceptions of animal pests and the number of times they were collected were as follows: ferret (27), gerbil (4), hawk (1), hedgehog (3), and monk parakeet (7).

The following lists the rated pests found at the border stations for the month of December, 1995. This is an amazing array of pest species considering the time of year, and indicates the level of risk agricultural pests being transported into California from other states presents.

<i>Acyrtosiphon</i> sp. (aphid)	<i>Cydia</i> sp. (a fruit worm)	Pomerinea (a primitive ant)
<i>Aligia</i> sp. (leafhopper)	<i>Centarea diffusa</i> (diffuse knapweed)	<i>Pseudaulacaspis cockerelli</i> (magnolia white scale)
<i>Anthonomus grandis</i> (boll weevil)	<i>Cuscuta</i> sp. (dodder)	<i>Rhagoletis pomonella</i> (apple maggot)
<i>Aonidiella orientalis</i> (Oriental scale)	<i>Empoasca</i> sp. (leafhopper)	<i>Rhyacionia bouliana</i> (European pine shoot moth)
<i>Apterona helix</i> (garden bagworm)	<i>Euxoa</i> sp. (cutworm)	<i>Solenopsis invicta</i> (red imported fire ant)
<i>Araecerus fasciculatus</i> (coffee bean weevil)	Fulgoroidea (planthopper nymphs)	<i>Solenopsis</i> sp. (a fire ant)
Arctiidae (woollybears)	<i>Genaparlatoria pseudaspidiotus</i> (vanda orchid scale)	<i>Tapinoma melanocephalum</i> (black headed ant)
<i>Unaspis yanonensis</i> (arrowhead scale)	<i>Cydia caryana</i> (hickory shuckworm)	<i>Tapinoma</i> sp. (an ant)
<i>Aspidiotus destructor</i> (coconut scale)	<i>Ischnaspis longirostris</i> (black thread scale)	<i>Technomyrmex albipes</i> (white footed ant)
<i>Gypsophila paniculata</i> (Baby's breath)	<i>Cardaria chalepensis</i> (lens-podded hoary cress)	<i>Tetramorium</i> sp. (an ant)
<i>Camponotus abdom. floridanus</i> (Florida carpenter ant)	<i>Lepidosaphes</i> sp. (an armored scale)	<i>Thysanofiorinia nephelii</i> (longan scale)
<i>Camponotus</i> sp. (a carpenter ant)	<i>Marmara</i> sp. (a citrus peel miner)	<i>Solanum eleagnifolium</i> (White horsenettle)
<i>Ceratitus capitata</i> (Mediterranean fruit fly)	<i>Meloidogyne</i> sp. (root-knot nematode)	Zygopinae (a weevil)
<i>Curculio caryae</i> (pecan weevil)	<i>Pectinophora gossypiella</i> (pink bollworm)	
<i>Curculio</i> sp. (a weevil)	<i>Pheidole</i> sp. (an ant)	

~ PLANT PATHOLOGY HIGHLIGHTS ~

Karnal Bunt Project Summary for 1996

July 23, 1996

The California wheat harvest in an area suspected to be infested with karnal bunt has ended. Results from a five month program of intensive survey for karnal bunt showed the disease was not widespread. The positive fields represent less than 3% of the total acreage in the quarantine area (3,389 acres out of a total of 129,956).

The positive fields are located in two small areas. The majority of the fields (62) are in the Palo Verde Valley near Blythe in Riverside County. Seven additional fields, totaling 41 acres, were discovered in the Bard/Winterhaven area of Imperial County, on the Arizona border.

Background

In March of this year, spores recovered from eight California grain storage facilities were identified as being karnal bunt. It was also discovered that several fields had been planted using contaminated seed from Arizona.

Karnal bunt is a disease of wheat that may affect both the quality of the grain and the yield. It has no human health impacts but would have a major impact on our export markets. Fifty countries prohibit or regulate grain contaminated with Karnal bunt.

California wheat was valued at \$141 million in 1995. This year the wheat industry estimates that the value has doubled due to crop shortages elsewhere in the U.S.

A quarantine was placed in April on all of Imperial and part of Riverside Counties. The quarantine area is currently 6,000 square miles and encompasses 129,956 acres of wheat. The purpose of a quarantine is to prevent the spread of the disease to non-infected portions of the state.

Project Components

California wheat grown outside the quarantine area is not regulated in any way. Inside the quarantine area, anyone who grows, handles, or transports wheat must sign a compliance agreement that limits the movement of wheat and associated equipment, trucks and rail cars unless proper safeguards are taken.

As part of the quarantine effort, every field inside the quarantine area has been tested for karnal bunt prior to harvest. There are 2,326 fields. Of these, 69 tested positive for the disease.

Each remaining grain storage and handling facility in the quarantine area was tested to ensure that harvested grain was stored in clean facilities. Over 300 samples taken from these facilities were negative.

As an additional safeguard, every rail car or truck carrying wheat that has tested negative in the field is tested again before moving from the quarantine area. Of 1,471 rail cars tested, fourteen were positive for karnal bunt (ten from Riverside and four from Imperial), less than .1% of the cars tested. Infected grain must remain in the quarantine area.

Wheat grown for seed in the quarantine area is subjected to an even more rigorous testing program. A single sample from Imperial County out of 760 seed samples tested overall was positive for karnal bunt. This seed will not be allowed to move from the quarantine area.

National Survey

California is testing wheat from every wheat growing county (33 total) in the state as part of a national karnal bunt survey. Over 210 samples from 25 counties tested so far have been negative.

Although a single sample from the San Joaquin Valley did test positive, an investigation at the field locations represented by the sample uncovered no infected fields. Over 479 samples taken from truckloads of wheat and other sources in the suspect area were negative for karnal bunt. Field surveys are scheduled for the 1997 growing season.

PROJECT STATISTICS AT A GLANCE				
Current Quarantine Area		Imperial Co. (approx. 4,175 sq. mi.)	Eastern Riverside Co. (approx. 1,825 sq. ft.)	
Acres of Wheat in Quarantine Area		114,514	15,442	
Number of Fields Sampled (2,326 total fields)	positive	7	62	
	negative	1,989	268	
Acreage of Fields Sampled (129,956 total acres)	positive	41	3,348	
	negative	114,473	12,094	
Number of Rail Cars Sampled (1,471 total rail cars)	positive	4	10	
	negative	1,349	108	
Number of Facilities Confirmed Positive (decontamination in process)			8	

The following pages represent a complete check list for the parasitic plants of California. This includes mistletoe, dodder, and a number of other interesting and unusual plant forms. The work was compiled by CDFA Plant Pathologist Tim Tidwell, as part of a strong personal interest in the subject. This list will be in two parts; the last part will be published in the next issue. This issue contains the introductory and preliminary information, along with the alphabetical listing by parasitic species. The listing in next issue will be alphabetically by host.

**INDEX OF PHANEROGAMIC PARASITES OF
CALIFORNIA**

1996

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DEPARTMENT OF FOOD AND AGRICULTURE
SACRAMENTO, CALIFORNIA**

CONTENTS

PREFACE	24
ACKNOWLEDGEMENTS	24
LIST OF CITED REFERENCES	25
TAXONOMIC REFERENCES	26
DWARF MISTLETOES	26
LEAFY MISTLETOES	29
DODDER	30
BROOMRAPES	32
PART I: PARASITE-HOST INDEX	33
PART II: HOST-PARASITE INDEX	(next issue)

PREFACE

In literature one occasionally finds the phanerogamic, or seed-bearing parasitic plants, referred to as "parasitic weeds." But this terminology sells them short. These plants are more than just weeds. The interactions of these unique plant pathogens with their hosts are so intriguing that they command the interest of not only the weed scientist, but also the plant pathologist, the taxonomist, the plant anatomist, and the plant physiologist.

Worldwide, more than 2,500 species of flowering plants are known to live as parasites on other plants. Some of these parasites have chlorophyll and roots and are capable of producing their own food through photosynthesis, but still depend on their hosts for certain minerals and some organic compounds. Others, such as the leafy mistletoes, have chlorophyll in green leaves and stems, and therefore have the ability to manufacture their own food from carbon dioxide and water, but have no true roots of their own. Consequently, these parasites must depend on their hosts for their supply of water and minerals. Still other phanerogamic parasites have little or no chlorophyll, no roots, and are entirely dependent on their host.

The host ranges of phanerogamic parasites are relatively wide for some species, and relatively restricted for others. In this index one will also find references to one parasitic plant parasitizing another, and occasionally even a reference to a parasitic plant actually parasitizing another plant of the same species ("autoparasitism"). In a few instances, usually with herbarium material, known root parasites were "presumed" to be parasitic on a particular host. This was based on the fact that when the plant material was collected, actual root-to-root connections were not confirmed, but there were no other hosts nor parasites present in the vicinity. Such records are noted in this index by an asterisk.

This index is a collection of data for California. Information was compiled from various journals and other publications, from diagnostic laboratory records, and from herbarium records. It makes no attempt to authenticate the records cited, but rather to merely report them, along with the source of the information. It is not meant to be exhaustive, but rather representative, of the phanerogamic parasites found in California.

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DWARF MISTLETOES

Arceuthobium spp.

Dwarf mistletoes are flowering plants that are parasitic on conifers. They occur in all parts of the world where conifers grow, but are most prevalent and most damaging in western North America, where some 28 of the 32 known taxa may be found. Most species of dwarf mistletoes are confined to a specific host, or a relatively restricted taxonomic group of hosts.

Dwarf mistletoes are considered "true parasites" in that they possess very little chlorophyll, and consequently are dependent on their hosts for water, minerals, and food. Dwarf mistletoes damage their hosts primarily by causing swelling and deformity of host branches, and excessive lateral bud and shoot formation (a "witches broom"). These brooms drain off vital nutrients otherwise used to grow productive wood and foliage. They grow to substantial size and weight, and may cause branch failure, creating hazards in public areas such as campgrounds. Heavy infection also predisposes trees to wind-throw and breakage, as well as to attack from insects and plant pathogens. Infected trees may be severely stunted, resulting in height reductions of 50 to 80 %. Dwarf mistletoe-infected trees may also be severely deformed, thus reducing timber quality by the excessive knots, and the spongy, weak, swollen branches. Dwarf mistletoes are capable of killing young trees and saplings.

The foliage of dwarf mistletoes is inconspicuous. The leaves are somewhat scale-like, and are the same color as the stem. Shoot length ranges from 1.5 cm to 10 cm, depending on the species.

Dwarf mistletoe seeds are explosively "shot" from female plants for distances up to 20 meters. Needles of neighboring trees intercept the sticky seeds in flight, where the seeds remain until rain water lubricates the seeds enough to slide down to a branch. When seeds come in contact with relatively new branch tissue (usually 5 years old or less) of a susceptible host species, a germ tube grows along the bark until it meets a bud or leaf base. The tissue flattens out on the bark surface and forms a "holdfast" structure, from which a wedge of mistletoe tissue (a "haustorium") penetrates the host branch, beginning the "infection." This wedge of mistletoe tissue grows and ramifies inside the bark of the host branch, then puts down "sinker" into successive layers of host xylem. Ultimately a complex ramifying system of haustorial strands is produced that consists of strands external and parallel to the host cambium, as well as a system of sinkers which are oriented radially into the xylem and phloem of the host. Frequently xylem to xylem connections develop between the host tree's tracheids and the mistletoe's haustoria vessels. Aerial shoot formation takes place about 2-5 years following infection, and male or female flower formation occurs about 1 to 5 years following aerial shoot formation. Fruits may take several months to mature. Male shoots die after flowering, females die after releasing their mature seeds. When the shoots die and drop off the infected branch, they leave a distinctive basal "cup" on the host bark. Eventually the old infection sites deteriorate and usually become infected with decay fungi.

Prevention is the best control of dwarf mistletoe. One way to accomplish this is by adequately mixing tree species when initially planting a site, rather than planting a "mono-culture," i.e. large concentrations of a single host species. When feasible, in areas in which a particular species of dwarf mistletoe is known to be a problem, include conifer species among the newly planted seedlings which are not hosts of that species of dwarf mistletoe. To eliminate or reduce the incidence of a dwarf mistletoe species on a given site, infected host trees are sometimes intentionally killed to prevent the mistletoe from completing its life cycle. This halts the production and dissemination of berries and seeds. The most economical means of inoculum reduction is to simply remove infected trees when an area is logged or thinned.

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LEAFY MISTLETOES

Phoradendron spp.*Viscum album*

California is home to several species of the leafy mistletoe genus *Phoradendron*, as well as the European leafy mistletoe, *Viscum album*. Some species of *Phoradendron* (which means "tree-thief") attack many tree species, and some are only known to attack hosts within a single genus. *Phoradendron* is known only in the Western Hemisphere, with the area of greatest diversity in the tropics. Seven species commonly occur in California, parasitizing both broadleaf trees and some conifers. *Viscum album*, the common leafy mistletoe of Europe, was intentionally introduced into California by horticulturist Luther Burbank about 1900. After 75 years of establishment in the state, it had spread from its original site to about a 16 square mile area, the major concentration of the infected trees occurring within about a mile of the original site of Burbank's experimental farm. Burbank originally had inoculated apple trees using seeds, and 75 years later the parasite was found on twenty additional California hosts.

Leafy mistletoes are "hemi-parasites," i.e. they are dependent on their hosts primarily for water and minerals, but manufacture their own food via photosynthesis using the chlorophyll in their green leaves. However, even in the absence of the green aerial portions of the mistletoe plant, the parasite can live in a host branch for many years. Trees heavily parasitized by leafy mistletoes are weakened, reduced in growth rate, and disfigured, but seldom are killed by the mistletoe alone. The most significant damage is probably done by predisposing weakened trees to damage from other pests or from adverse conditions such as drought stress. The parasite stimulates the growth of abnormal and excessive branching ("brooming") and causes branch swellings which eventually become sites for decay organisms. In addition to simply reducing timber quality, weakened branches are prone to damage from wind breakage. Besides being forest pests, leafy mistletoes also have the potential to become significant agricultural pests in orchards.

Leafy mistletoes are primarily spread by birds which feed on the berries, then excrete the seeds while perched in a host tree. The seeds have a sticky coating which helps them stick to branches on which they fall. The mistletoe seed germinates on a tree branch, forms an attachment disc on the bark, then a haustorial strand grows from the disc into the branch through a lenticel or axillary bud. The haustorial strand enlarges and branches to form the parasitic haustorial system that includes radial "sinks" which invade the host tree's phloem tissue. The sinks invade the rays and advance radially with the host cambium each year, and the haustoria also extend parallel to the branch. Once the mistletoe has a well-established haustorial "root system" in the host branch, aerial shoots of the mistletoe develop. Several years are necessary after the initial infection to produce a seed-bearing mistletoe plant. Mistletoe tends to be a more serious problem in larger, older trees than in smaller trees, possibly due to a preference on the part of birds for larger or taller trees. If birds spend a lot of time feeding on mistletoe berries in a particular tree, the mistletoe plant population can increase dramatically in that tree!

Several approaches can be taken to control leafy mistletoe. Pruning the host branch well below the point of mistletoe attachment will insure removal of the entire haustorial system from which another mistletoe plant could regrow. In addition, arborists continue to explore the efficacy of tree wraps, herbicides, and tree paints to control leafy mistletoe. And while it is true that merely removing the aerial shoots from an infected branch will not eradicate the mistletoe plant, since the parasite may still continue to slowly grow within the host, it is not an entirely fruitless measure. Removal of mistletoe shoots every couple of years at least reduces the amount of mistletoe seed inoculum for that tree and neighboring trees; it reduces some of the parasitic "drain" on the host branch; and because of the lack of berries, it reduces the attractiveness of the tree to birds. For seriously infested sites, one should consider the removal of heavily infected trees, and replacement with tree species which are not hosts to the particular mistletoe species present.

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DODDER *Cuscuta* spp.

Dodder (*Cuscuta* spp.) is a parasitic plant with tough, curling, leafless, string-like stems which twine around its host plant. There are many descriptive common names for dodder, such as "strangleweed," "goldthread," "pull-down," "devil's hair," and "hellbind," just to name a few. From a distance dodder plants look like masses of yellow to orange string tangled in a plant. Worldwide, there are at least 170 species of dodder, most of which occur in North and South America, although dodder species are reported on all seven continents. Damage from dodder comes both in the physical damage it does to its host—stunting and weakening of the host plants, reduced stand density, poor flower and seed set, or even mortality—as well as the economic damage from the rejection of seed lots for export due to dodder contamination. Clover seed production in Europe came to a complete halt early in the twentieth century due to problems brought on by dodder. Here in California, 86% of San Joaquin County's 1951 seed lots grown for export certification were rejected that year because of dodder contamination.

Some species of dodder show a preference for a very narrow range of hosts. Other species can parasitize a wide range of plants. There are documented instances of land being cleared for agricultural use which had formerly been wooded or populated by native vegetation infested with dodder, only to result in massive dodder epidemics in the new agricultural crop. Most dodder species commonly found attacking weeds along the sides of roads are usually harmless to nearby agricultural crops. Nonetheless, it is a good idea to have such species identified to be certain. Some of the most important economic crops in California that are parasitized by dodder are alfalfa and clover, as well as sugar beets, tomatoes, onions and asparagus. Fortunately, certain plants are less susceptible to parasitism by dodder, such as small grains. One species of dodder, *Cuscuta pentagona*, has been successfully grown as an autotroph on sterile agar medium.

After the dodder seed germinates, the seedling forms a small leafless stem that twines around until it strikes a host plant. Some dodders will grab onto any host temporarily until they can locate a preferred host. Once the dodder stem locates a susceptible host, it tightly encircles the stem of the host plant and sinks peg-like "haustoria" into the host stem that act like "roots," parasitizing the host's food and water supply. Not uncommonly, hypertrophy (swellings) develop at the point of haustorial attachment. By this time the rudimentary root of the dodder plant withers and dies, severing all contact with the ground, and the parasite lives entirely at the expense of the host to which it has become attached. From there, the dodder plant continues to grow and contact surrounding plants as well. Documented cases of a single dodder seedling eventually covering 10 to 15 square feet are not uncommon. If a germinated dodder seedling fails to contact a susceptible host within about a month, it simply dies. When a host plant dies, so does the dodder, but usually not until it has managed to flower, fruit, and drop seed on the soil. Amazingly, some dodder plants do not even require a living host on which to complete their life cycle, i.e. to bring their seeds to maturity. If the dodder is just past its flowering stage when

the host crop is cut, it can finish the maturation process of its seeds even on the cut hay! In addition, dodder seed which has only achieved "half-maturity" can still germinate as readily as fully matured seed! A single dodder plant is capable of producing up to 3,000 seed. If the crop plants can be cut before the dodder's flowering stage, there is much less chance of the dodder producing viable seed.

There are a number of ways to spread dodder. Contamination of seed lots is probably the most common means, particularly in the cases of clover and alfalfa seeds which look similar and weigh the same as dodder seed. But dodder can also be moved as stem fragments as well as seed in infested hay, contaminated farm machinery and implements, irrigation water, grazing animals, and in animal manures which have not been adequately composted. In temperate areas, as well as in some colder climates, the dodder plants can also over-winter on as short pieces of dodder stems attached to perennial hosts. Even the internal haustorial tissue can successfully over-winter in dodder-induced galls of host tissue.

The hard dodder seeds can remain dormant in soil for many years. Records of seed viability lasting ten years under field conditions are documented. Only a small percentage of the seeds germinate in any one year. Consequently, once a field is infested with dodder seed, it will be present for many years to come. Some dodder seeds have been observed to germinate at soil depths of up to ten centimeters; more commonly, in the case of the common alfalfa "field dodder" (*Cuscuta pentagona*) for example, the majority of the seeds germinate and emerge from soil depths of about three centimeters or less.

Some dodders contain small amounts of chlorophyll. Consequently, some photosynthesis may occur during the seedling stage, but even this rapidly diminishes as the plants become more parasitic, extracting their food, inorganic salts and water from their hosts.

The most effective control against dodder is, of course, preventing its introduction, particularly via contaminated seed. Seed processors go to great efforts to cleanse alfalfa seed lots of dodder seed using various methods. In addition, constant survey should be made for dodder patches so that they can be eliminated early, preferably before the flowering stage. Spot killing of the dodder plants along with their hosts using herbicides or burning is one approach. Mowing down host plants before the dodder has a chance to flower, and rotating with non-host crops are other, although more temporary, solutions. It is important to promptly detect and prevent "bridging" of dodder plants from one row of a host crop to adjacent rows in commercial fields planted to a single crop. Controlling weeds that also serve as hosts of the same dodder is important for the same reason. Of course, in the case of infected woody perennials, one can simply prune out the infected branches and destroy them along with the dodder. And lastly, although no "ideal" material is available yet, both chemical and biological controls for dodder are currently under investigation.

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BROOMRAPES*Orobanche* spp.

The broomrapes are annual flowering plants that parasitize the roots of other plants. The role of broomrapes as parasites has been recognized since the second century BC. Broomrapes lack roots of their own, as well as chlorophyll. Consequently, water and food are taken from a host plant by way of attachment to the host's root system. Broomrapes are erect, yellowish plants with scaly or hairy stems and fleshy underground parts. Flowers of broomrape plants occur in spikes on the upper part of the plant. Where native, the morphology of broomrapes is highly variable. This variability is much less pronounced where the broomrape has been introduced. Unquestionably, the most notorious genus of root parasites in California is *Orobanche*, the true broomrapes. Even the meaning of the Greek name "*Orobanche*" is ominous sounding—"vetch strangler." *Orobanche* is a very large genus that includes several California natives. In California, broomrapes affect a wide variety of native and introduced host plants, including many ornamentals and a number of significant agricultural crops such as lettuce, tomatoes, various legumes and crucifers.

One of the most striking features of broomrapes is their tremendous seed production, which is the secret of their amazing spread and survival. One *Orobanche ramosa* plant, e.g., may produce as many as fifty thousand of the tiny seeds that germinate only in the presence of the roots of a susceptible host plant. They can lie dormant in a field for more than a decade where they wait to come in contact with roots of a susceptible host. Meanwhile, the seeds are easily carried throughout a field, or from field to field, via irrigation water or farm equipment. Since numerous broomrape plants may be attached to the roots of a single host, the capacity for seed production is astronomical. In the 1960's, California's tomato growing area experienced an epidemic of branched broomrape, *Orobanche ramosa*. Reports of as many as fifty broomrape plants on a single tomato plant were not uncommon. Thus, literally millions of the tiny, long-lasting broomrape seeds could be produced from a single infected tomato plant.

It is believed that branched broomrape, *Orobanche ramosa*, was accidentally introduced into North America from China in the late 1800's with hemp seed (*Cannabis sativa*), that was being grown as a fiber crop at the time. In 1929 branched broomrape was found in a California tomato field in Alameda County. From there it spread to several thousand acres, presumably via flooding, irrigation, and farm equipment. In 1959-1960 two more infestations of branched broomrape were found in California's San Joaquin Delta area, that were well established by the time they were discovered. Probably not by coincidence, early CDFA records indicate that at least one farmer was attempting to grow hemp commercially in the Delta in the early 1900's.

The branched broomrape outbreak of the 1960's resulted in widespread stunting of tomato plants and serious tomato yield reductions. Numerous scientific studies were conducted that dealt with life cycles, host ranges, and control strategies. Fumigation was carried out in some fields. Surveys conducted at the time revealed that the introduced pathogen had a host range of at least forty different hosts in California. More recently (1984), K.R. Langdon of the Florida Department of Agriculture and Consumer Services compiled a list of over sixty hosts of branched broomrape. Since tomatoes were one of the most important vegetable crops in California, a "branched broomrape eradication project" that involved the University of California, USDA, and the California Department of Food and Agriculture was undertaken to eradicate this pest. The project was carried on for several years, but ultimately was abandoned in the late 1970's due to lack of funding. Currently, because of careful cultural practices as well as changes in crop selection, branched broomrape is neither widespread nor a particularly serious problem in California agriculture.

Actually, California has experienced not one, but two "broomrape scares" this century. In the late 1950's "Cooper's broomrape," *Orobanche cooperi*, a native of the Southern California desert, was discovered to be infecting tomato transplants in the Coachella Valley. These transplants were being grown for planting commercial tomato fields in various locations throughout the state. The panic quickly subsided, however, when it was found through careful field experimentation that this broomrape was relatively limited in its range to California's hot desert areas, and was unable to effectively germinate, infect, grow, and reproduce in the cooler, commercial tomato growing areas of the state.

Economic control of broomrapes consists primarily of spot treatment of infected plants (rouging infected plants), prevention (using clean, pathogen-free crop seed), cultural techniques (deep plowing, rotation), and through regulatory action such as quarantines, harvesting restrictions, detection survey, and seed certification. Fumigation has been shown to be effective, but is an expensive option. Some biocontrols (using pathogens and insects to control the parasite) have shown promise, but need further study and development.

In addition to *Orobanche*, several other genera of plants in California, including some with chlorophyll,

are considered root parasites of other plants. For example, in the plant family Scrophulariaceae, the genera *Castilleja*, *Pedicularis*, and (some) *Orthocarpus*, although green, are considered to be at least partially parasitic on roots of other plants. The genera *Pilostyles*, *Pholisma*, *Ammobroma*, and *Boschniakia*, like *Orobanche*, are examples of other California plants without chlorophyll that live exclusively as parasites on the roots of other plants.

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PART 1: PARASITE-HOST INDEX

- AMMOBROMA SONORAE TORR. EX GRAY
SEE: PHOLISMA SONORAE (A. GRAY) G. YATSKIEVYCH
- ANOPLANTHUS COMOSUS (HOOK.) WALP.
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (BECK) HECKARD
- APHYLLON ARENOSA SUKSD.
SEE: OROBANCHE MULTIFLORA NUTT. VAR. ARENOSA (SUKSD.) MUNZ
- APHYLLON CALIFORNICUM (CHAM. & SCHLDL.) GRAY
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL.
- APHYLLON COMOSUM (HOOK.) A. GRAY
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (BECK) HECKARD
- APHYLLON COOPERI GRAY
SEE: OROBANCHE COOPERI (GRAY) HELLER
- APHYLLON MINUTA SUKSD.
SEE: OROBANCHE UNIFLORA L.
- APHYLLON PINORUM GRAY
SEE: OROBANCHE PINORUM GRAY
- APHYLLON SEDI SUKSD.
SEE: OROBANCHE UNIFLORA L.
- APHYLLON TUBEROSUM GRAY
SEE: OROBANCHE BULBOSA (GRAY) G. BECK
- APHYLLON VIOLACEUM EASTW.
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA
- ARCEUTHOBium ABIETINUM ENGELM. F. SP. CONCOLORIS HAWKS. & WIENS
ABIES CONCOLOR (GORD. & GLEND.) LINDL.
ABIES GRANDIS (DOUGL. EX D. DON) LINDL.
PICEA BREWERIANA WATS.
PINUS CONTORTA DOUGL. EX LOUD.
PINUS LAMBERTIANA DOUGL.
PINUS MONTICOLA DOUGL.
- HAWKSWORTH & WIENS, 1972 EX HILDEBR.
HAWKSWORTH & WIENS, 1972
FRANKEL, ET AL., 1990
HAWKSWORTH & SCHARPF, 1984
HAWKSWORTH & SCHARPF, 1984
HAWKSWORTH & SCHARPF, 1984

ARCEUTHOBium ABIETINUM ENGELM. F. SP. MAGNIFICAE HAWKS. & WIENS
 ABIES CONCOLOR (GORD. & GLEND.) LINDL. EX HILDEBR.
 ABIES MAGNIFICA A. MURRAY
 ABIES PROCERA REHD.

ARCEUTHOBium AMERICANUM NUTT. EX ENGELM. IN GRAY
 ABIES CONCOLOR (GORD. & GLEND.) LINDL. EX HILDEBR.
 PINUS CONTORTA DOUGL. EX LOUD.
 PINUS CONTORTA DOUGL. EX LOUD. SSP. BOLANDERI (PARL.) CRITCHF.
 PINUS CONTORTA DOUGL. EX LOUD. SSP. MURRAYANA (BALF.) ENGELM.
 PINUS CONTORTA DOUGL. EX LOUD. VAR. LATIFOLIA (ENGELM.) CRITCHF.
 PINUS JEFFREYI GREV. & BALF.
 PINUS MONTICOLA DOUGL.
 PINUS PONDEROSA LAWS.

ARCEUTHOBium BLUMERI A. NELSON
 SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY

ARCEUTHOBium CALIFORNICUM HAWKS. & WIENS
 PINUS LAMBERTIANA DOUGL.
 PINUS MONTICOLA DOUGL.

ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY
 ABIES CONCOLOR (GORD. & GLEND.) LINDL. EX HILDEBR.
 ABIES GRANDIS (DOUGL. EX D. DON) LINDL.
 ABIES MAGNIFICA A. MURRAY
 ABIES MAGNIFICA A. MURRAY VAR. SHASTENSIS LEMMON
 PICEA SP.
 PICEA BREWERIANA WATS.
 PICEA PUNGENS ENGELM.
 PINUS ALBICAULIS ENGELM.
 PINUS ATTENUATA LEMMON
 PINUS BALFOURIANA GREV. & BALF.
 PINUS CONTORTA DOUGL. EX LOUD.
 PINUS CONTORTA DOUGL. EX LOUD. SSP. BOLANDERI (PARL.) CRITCHF..
 PINUS CONTORTA DOUGL. EX LOUD. SSP. CONTORTA
 PINUS CONTORTA DOUGL. EX LOUD. SSP. MURRAYANA (BALF.) ENGELM.
 PINUS COULTERI D. DON
 PINUS LEXILIS E. JAMES
 PINUS HALEPENSIS MILL.

UCR HERBARIUM
 HAWKSWORTH & WIENS, 1972
 BEGA, 1978
 UCB HERBARIUM
 HAWKSWORTH & SCHARPF, 1984
 MADRONO (1960) 15:129-139
 BEGA, 1978
 UCB HERBARIUM
 MADRONO (1960) 15:129-139
 HAWKSWORTH & SCHARPF, 1984
 BEGA, 1978
 HAWKSWORTH & WIENS, 1972
 HAWKSWORTH & WIENS, 1972
 HILGARDIA (1965) 37:115-153
 UCB HERBARIUM
 PHYTOPATHOLOGY (1962) 52:750
 UCB HERBARIUM
 MUNZ & KECK, 1973
 MADRONO (1960) 15:129-139
 CDFA PLANT PATHOLOGY
 MADRONO (1960) 15:129-139
 USDA #165
 PLANT DISEASE REPORTER (1965) 49:647
 MADRONO (1960) 15:129-139
 UCB HERBARIUM
 HAWKSWORTH & WIENS, 1972
 HAWKSWORTH & WIENS, 1972
 HAWKSWORTH & WIENS, 1972
 MADRONO (1960) 15:129-139
 PLANT DISEASE (1986) 70:173

ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY - *continued*

PINUS JEFFREYI GREV. & BALF.
 PINUS LAMBERTIANA DOUGL.
 PINUS MONOPHYLLA TORR. & FREM.
 PINUS MONTICOLA DOUGL.
 PINUS MURICATA D. DON
 PINUS PINASTER AITON
 PINUS PINEA L.
 PINUS PONDEROSA LAWS.
 PINUS RADIATA D. DON
 PINUS SABINIANA DOUGL.
 PSEUDOTSUGA MENZIESII (MIRB.) FRANCO
 TSUGA MERTENSIANA (BONG.) CARR.

ARCEUTHOBium CAMPYLOPODUM F. ABIETINUM (ENGELM.) GILL
 ABIES AMABILIS (DOUGL.) FORBES
 ABIES CONCOLOR (GORD. & GLEND.) LINDL. EX HILDEBR.
 ABIES MAGNIFICA A. MURRAY
 PICEA BREWERIANA WATS.

ARCEUTHOBium CAMPYLOPODUM F. BLUMERI (A. NELS.) GILL
 SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY

ARCEUTHOBium CAMPYLOPODUM F. CAMPYLOPODUM ENGELM.
 PINUS COULTERI D. DON
 PINUS JEFFREYI GREV. & BALF.
 PINUS PONDEROSA LAWS.
 PINUS RADIATA D. DON

ARCEUTHOBium CAMPYLOPODUM F. CYANOCARPUM (A. NELS.) GILL
 SEE: ARCEUTHOBium CYANOCARPUM COULT. & NELS.

ARCEUTHOBium CAMPYLOPODUM F. DIVARICATUM (ENGELM.) GILL.
 SEE: ARCEUTHOBium DIVARICATUM ENGELM.

ARCEUTHOBium CAMPYLOPODUM F. MICROCARPUM (ENGELM.) GILL
 SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY

ARCEUTHOBium CAMPYLOPODUM F. TSUGENSE (ROSENDAHL) GILL
 SEE: ARCEUTHOBium TSUGENSE (ROSENDAHL) G. N. JONES

BEGA, 1978
 MADRONO (1960) 15:129-139
 MADRONO (1960) 15:129-139
 PLANT DISEASE REPORTER (1965) 49:647
 PLANT DISEASE REPORTER (1967) 51:856
 HAWKSWORTH & WIENS, 1972
 CDFA BOTANY HERBARIUM
 PLANT DISEASE (1986) 70:173
 MADRONO (1960) 15:129-139
 MADRONO (1960) 15:129-139
 UCB HERBARIUM
 MADRONO (1960) 15:129-139
 UCB HERBARIUM
 MADRONO (1960) 15:129-139
 UCB HERBARIUM
 PHYTOPATHOLOGY (1969) 59:1657
 PHYTOPATHOLOGY (1968) 58:1066
 PLANT DISEASE REPORTER (1970) 54:488-489

BEGA, 1978
 HEPTING, 1971
 HEPTING, 1971
 PLANT DISEASE REPORTER (1964) 48:913

ARCEUTHOBium CAMPYLOPODUM F. TYPICUM GILL

SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY

ARCEUTHOBium CAMPYLOPODUM VAR. MACRARTHROn ENGELM.

SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY

ARCEUTHOBium CYANOCARPUM COULT. & NELS.

PINUS ALBICAULIS ENGELM.

PINUS ARISTATA ENGELM.

PINUS BALFOURIANA GREV. & BALF.

PINUS FLEXILIS E. JAMES

PINUS LAMBERTIANA DOUGL.

PINUS MONTICOLA DOUGL.

PINUS SABINIANA DOUGL.

BEGA, 1978

MUNZ & KECK, 1973

MATHIASSEN & HAWKSWORTH, 1988

BEGA, 1978

UCB HERBARIUM

BEGA, 1978

HEPTING, 1971

ARCEUTHOBium DIVARICATUM ENGELM.

PINUS EDULIS ENGELM.

PINUS MONOPHYLLA TORR. & FREM.

PINUS QUADRIFOLIA PARL.

HAWKSWORTH & SCHARPF, 1984

BEGA, 1978

HICKMAN, 1993

ARCEUTHOBium DOUGLASII ENGELM.

ABIES SP.

PICEA SP.

PSEUDOTSUGA MACROCARPA (VASEY) MAYR

PSEUDOTSUGA MENZIESII (MIRB.) FRANCO

BEGA, 1978

BEGA, 1978

MADRONO (1960) 15:129-139

BEGA, 1978

ARCEUTHOBium DOUGLASII ENGELM. VAR. TSUGENSIS (ROSEND.) M.E. J

SEE: ARCEUTHOBium TSUGENSE (ROSENDAHL) G.N. JONES

ARCEUTHOBium DOUGLASII VAR. ABIETINUM ENGELM.

SEE: ARCEUTHOBium DIVARICATUM ENGELM.

ARCEUTHOBium GRACILE ENGELM. IN GRAY

SEE: ARCEUTHOBium DIVARICATUM ENGELM.

ARCEUTHOBium LITTORUM HAWKSW. & D. NICKRENT

PINUS MURICATA D. DON

PINUS RADIATA D. DON

HICKMAN, 1993

HICKMAN, 1993

ARCEUTHOBium MONTICOLA HAWKSWORTH, WIENS, & D. NICKRENT
PINUS MONTICOLA DOUGL.

HICKMAN, 1993

ARCEUTHOBium OCCIDENTALE ENGELM.

ABIES GRANDIS (DOUGL. EX D. DON) LINDL.

PINUS ATTENUATA LEMMON

PINUS CONTORTA DOUGL. EX LOUD. SSP. BOLANDERI (PARL.) CRITCHF.

PINUS COULTERI D. DON

PINUS HALEPENSIS MILL.

PINUS JEFFREYI GREV. & BALF.

PINUS LAMBERTIANA DOUGL.

PINUS MURICATA D. DON

PINUS PINEA L.

PINUS PONDEROSA LAWS.

PINUS RADIATA D. DON

PINUS SABINIANA DOUGL.

PINUS SYLVESTRIS L.

PINUS THUNBERGIANA FRANCO

UCB HERBARIUM

HAWKSWORTH & WIENS, 1972

HAWKSWORTH & WIENS, 1972

HAWKSWORTH & WIENS, 1972

PLANT DISEASE (1986) 70:173

UCB HERBARIUM

UCB HERBARIUM

HAWKSWORTH & WIENS, 1972

PLANT DISEASE (1986) 70:173

HAWKSWORTH & SCHARPF, 1984

HAWKSWORTH & WIENS, 1972

HAWKSWORTH & WIENS, 1972

SCHARPF & MCCAIN, 1988

PLANT DISEASE (1986) 70:173

ARCEUTHOBium SISKIYOUENSE HAWKSWORTH, WIENS, & D. NICKRENT
PINUS ATTENUATA LEMMON

HICKMAN, 1993

ARCEUTHOBium TSUGENSE (ROSENDAHL) G. N. JONES

ABIES SP.

PICEA BREWERIANA WATS.

PINUS SP.

PINUS FLEXILIS E. JAMES

PINUS MONTICOLA DOUGL.

TSUGA HETEROPHYLLA (RAF.) SARG.

TSUGA MERTENSIANA (BONG.) CARR.

BEGA, 1978

HAWKSWORTH & WIENS, 1972

BEGA, 1978

HAWKSWORTH & SCHARPF, 1984

HAWKSWORTH & WIENS, 1972

BEGA, 1978

HAWKSWORTH & WIENS, 1972

ARCEUTHOBium TSUGENSE (ROSENDAHL) G. N. JONES SSP. MERTENSIANA HAWKSWORTH & D. NICKRE

PINUS MONTICOLA DOUGL.

TSUGA MERTENSIANA (BONG.) CARR.

HICKMAN, 1993

HICKMAN, 1993

ARCEUTHOBium TSUGENSE (ROSENDAHL) G. N. JONES SSP. TSUGENSE HAWKSWORTH & D. NICKRE

TSUGA HETEROPHYLLA (RAF.) SARG.

HICKMAN, 1993

BOSCHNIAKIA HOOKERI WALP.

ARBUTUS SP.

JEPSON, 1925

BOSCHNIAKIA HOOKERI WALP. - continued

ARCTOSTAPHYLOS SP
GAULTHERIA SHALLON PURSH

BOSCHNIAKIA STROBILACEA GRAY

ARBUTUS SP.
ARBUTUS MENZIESii PURSH
ARCTOSTAPHYLOS SP.
ARCTOSTAPHYLOS CANESCENS EASTW.
ARCTOSTAPHYLOS GLAUCA LINDL.
ARCTOSTAPHYLOS NEVADENSIS GRAY
ARCTOSTAPHYLOS PATULA GREENE
GAULTHERIA SP.

BOSCHNIAKIA TUBEROSA JEPSON

SEE: BOSCHNIAKIA HOOKERI WALP.

CUSCUTA SP.

ABELIA GRANDIFLORA REHD.
ALLIUM CEPA L.
AMBROSIA DUMOSA (A. GRAY) PAYNE
ASPARAGUS OFFICINALIS L.
CALLISTEPHUS SP.
CALLISTEPHUS CHINENSIS (L.) NEE.
CARTHAMUS TINCTORIUS L.
CITRUS LIMON (L.) VAR. EUREKA
CITRUS X LIMONIA (RANGPUR LIME)
CUCURBITACEAE
DALEA SPINOSA GRAY
DAUCUS CAROTA L. SUBSP. SATIVUS (HOFFM.) ARCANG.
(CONTAMINATED SEED LOT)
GENTIANA HOLOPETALA (GRAY) HOLM.
GUIZOTIA ABYSSINICA (L.) CASS. (CONTAMINATED SEED LOT)
LEPIDOSPARTUM SQUAMATUM (GRAY) GRAY
LESPEDeza SP. (CONTAMINATED SEED LOT)
LYCOPERSICON ESCULENTUM MILL.
MONARDELLA SP.
PARTHENIUM ARGENTATUM GRAY
PENSTEMON NEWBERRYI GRAY
PETUNIA HYBRIDA VILM.

JEPSON, 1925

MUNZ & KECK, 1973

MUNZ & KECK, 1973
UCB HERBARIUM
UCR HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM

CDFA PLANT PATHOLOGY
ASHTON & SANTANA, 1976
UCR HERBARIUM
ASHTON & SANTANA, 1976
HORST (WESTCOTT)
CDFA PLANT PATHOLOGY
CDFA PLANT PATHOLOGY
PLANT DISEASE REPORTER (1969) 53:947
PLANT DISEASE REPORTER (1969) 53:947
ASHTON & SANTANA, 1976
UCR HERBARIUM

CDFA SEED LAB HERBARIUM
UCB HERBARIUM
CDFA SEED LAB HERBARIUM
UCR HERBARIUM
CDFA SEED LAB HERBARIUM
HORST (WESTCOTT)
UCB HERBARIUM
PLANT DISEASE REPORTER (1943) 27:63
UCB HERBARIUM
CDFA PLANT PATHOLOGY

CUSCUTA SP. - *continued*

RHODODENDRON SP.
SALVIA MELLIFERA GREENE
TRIBULUS TERRESTRIS L. (CONTAMINATED SEED LOT)
TRIFOLIUM SP.
TRIFOLIUM PRATENSE L. (CONTAMINATED SEED LOT)
ZEA MAYS L.

CUSCUTA AMERICANA L.
BETA VULGARIS L.
CITRUS SP.
NICOTIANA SP.

CUSCUTA APPROXIMATA BAB.
HEDERA HELIX L.
HYPERICUM CALYCINUM L.
LABURNUM ANAGYROIDES MEDIK.
MEDICAGO SATIVA L.
PHASEOLUS VULGARIS L.
PISUM SATIVUM L.
TRIFOLIUM SP.
VICIA FABA L.
VIGNA UNGUICULATA (L.) WALP.

CUSCUTA APPROXIMATA BAB. VAR. URCEOLATA (KUNZE) YUNCKER
SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA ARVENSIS BEYR. EX HOOK.
SEE: CUSCUTA PENTAGONA ENGELM.

CUSCUTA BRACHYCALYX (YUNCK.) VAR. APODANTHERA YUNCKER
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA BRACHYCALYX (YUNCK.) YUNCKER
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA CALIFORNICA HOOK. & ARN.
ABRONIA UMBELLATA LAM.
ACMISPON SP.
ADENOSTOMA FASCICULATUM H. & A.

CDFA PLANT PATHOLOGY
UCB HERBARIUM
CDFA SEED LAB HERBARIUM
ASHTON & SANTANA, 1976
CDFA SEED LAB HERBARIUM
CDFA PLANT PATHOLOGY

PHYTOPATHOLOGY (1949) 39:562-567
HORST (WESTCOTT)
PHYTOPATHOLOGY (1949) 39:562-567

PLANT DISEASE REPORTER (1965) 49:1015
PLANT DISEASE REPORTER (1965) 49:1015
PLANT DISEASE REPORTER (1965) 49:1015
ASHTON & SANTANA, 1976
PLANT DISEASE REPORTER (1965) 49:1015
PLANT DISEASE REPORTER (1965) 49:1015
MUNZ & KECK, 1973
PLANT DISEASE REPORTER (1965) 49:1015
PLANT DISEASE REPORTER (1965) 49:1015

UCR HERBARIUM
UCB HERBARIUM
PLANT DISEASE REPORTER (1967) 50:479-482

CUSCUTA CALIFORNICA HOOK. & ARN. - continued

- ALLIUM CEPA L.
 AMBROSIA SP.
 ARTEMISIA ROTHROCKII GRAY
 ASCLEPIAS FASCICULARIS DECNE. IN A.DC.
 ASTER SP.
 ATAENIA SP.
 ATRIPLEX PHYLLOSTEGIA (TORR.) WATS.
 BETA VULGARIS L.
 CALYPTRIDIMUM UMBELLATUM (TORR.) GREENE
 CHAMAEBATIA FOLIOSA BENTH.
 CHRYSOTHAMINUS NAUSEOSUS (PALL. EX PURSH) BRITTON
 CLEOMELLA SP.
 CLEOMELLA PLOCASPERMA WATS.
 CORETHROGYNE SP.
 CROTON CALIFORNICUS MUELL.-ARG.
 CUSCUTA AMERICANA L. (HYPERPARASITISM)
 CUSCUTA CALIFORNICA HOOK. & ARN. (AUTOPARASITISM)
 CUSCUTA CAMPESTRIS YUNCK. (HYPERPARASITISM)
 CUSCUTA SUBINCLUSA DUR. & HILG. (HYPERPARASITISM)
 DUDLEYA VISCIDA (WATS.) MORAN
 ENCELIA VIRGINENSIS A. NELS.
 ERIODICTYON CALIFORNICUM (H. & A.) TORR.
 ERIOGONUM SP.
 ERIOGONUM FASCICULATUM BENTH.
 ERIOGONUM FASCICULATUM SSP. FOLIOSUM (NUTT.) S. STOKES
 ERIOGONUM KENNEDYI PORTER IN WATS.
 ERIOGONUM UMBELLATUM TORR.
 ERIOGONUM WRIGHTII TORR. EX BENTH.
 GILLIA AGGREGATA (PURSH) SPRENG.
 HAPLOPAPPUS PINIFOLIUS GRAY
 HEDERA SP.
 HEMIZONIA CLEVELANDI GREENE
 HOLOCARPHA SP.
 HOLOZONIA FILIPES (H. & A.) GREENE
 LESSINGIA SP.
 LOTUS SP.
 LOTUS PURSHIANUS (BENTH.) CLEM. & CLEM.
 LUPINUS SP.
 LUPINUS CHAMISSONIS ESCHS.
- ASHTON & SANTANA, 1976
 UCB HERBARIUM
 UCR HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 PHYTOPATHOLOGY (1949) 39:562-567
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCR HERBARIUM
 PHYTOPATHOLOGY (1946) 36:386-388
 PHYTOPATHOLOGY (1946) 36:386-388
 PHYTOPATHOLOGY (1946) 36:386-388
 PHYTOPATHOLOGY (1946) 36:386-388
 UCR HERBARIUM
 UCR HERBARIUM
 UCB HERBARIUM
 UCR HERBARIUM
 USDA #165
 UCB HERBARIUM
 UCR HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 ASHTON & SANTANA, 1976
 UCB HERBARIUM
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 UCR HERBARIUM

CUSCUTA CALIFORNICA HOOK. & ARN. - *continued*

LYCOPERSICON ESCULENTUM MILL.

MESEMBRYANTHEMUM CRYSTALLINUM L.

MONARDELLA SP.

MONARDELLA ODORATISSIMA BENTH.

MONARDELLA VILLOSA BENTH.

NICOTIANA SP.

PENSTEMON SP.

PENSTEMON NEWBERRYI GRAY SSP. BERRYI (EASTW.) KECK

PHYTOLACCA AMERICANA L.

SALVIA SP.

SALVIA APIANA JEPSON

SAMOLUS PARVIFLORUS RAF.

SCIRPUS SP.

SOLIDAGO SP.

STEPHANOMERIA SP.

TRICHOSTEMA LAXUM GRAY

VICIA AMERICANA MUHL. EX WILLD.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. APODANTHERA YUNCKER

SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BRACHYCALYX YUNCKER

SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM

ACHILLEA SP.

ACHILLEA LANULOSA NUTT.

ASTER SP.

ASTER OCCIDENTALIS (NUTT.) T. & G.

ATRIPLEX SP.

CALYPTRIDUM SP.

CALYPTRIDUM UMBELLAT M (TORR.) GREENE

CEANOTHUS CORDULATUS KELL.

CHRYSOTHAMNUS NAUSEOSUS (PALL. EX PURSH) BRITTON

COMPOSITAE

DISTICHLIS SP.

ERIOGONUM SP.

ERIOGONUM NUDUM (DOUGL. EX BENTH.) S. STOKES

ERIOGONUM UMBELLATUM TORR.

ASHTON & SANTANA, 1976

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

PHYTOPATHOLOGY (1949) 39:562-567

UCB HERBARIUM

UCB HERBARIUM

PLANT DISEASE REPORTER(1965) 49:1002-1003

EL ALISO (1978) 9:197-278

UCB HERBARIUM

PHYTOPATHOLOGY (1955) 45:531-536

UCB HERBARIUM

UCB HERBARIUM

UCR HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

MUNZ & KECK, 1973

UCB HERBARIUM

UCB HERBARIUM

MUNZ & KECK, 1973

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

MUNZ & KECK, 1973

UCB HERBARIUM

ASHTON & SANTANA, 1976

UCB HERBARIUM

UCB HERBARIUM

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM. - continued

GRAMINAE

GRINDELIA SP.

HEMIZONIA CLEVELANDI GREENE

HEMIZONIA PUNGENS (H. & A.) T. & G.

HEMIZONIA RUSIS GREENE

MONARDELLA SP.

MONARDELLA ODORATISSIMA BENTH.

MONARDELLA VILLOSA BENTH. VAR. SHELTONII (TORR.) EPLING

ORTHOCARPUS COPELANDII EASTW.

SALVIA MELLIFERA GREENE

SOLANUM SP.

TRIFOLIUM SP.

WISLIZENIA REFRACTA ENGELM.

UCB HERBARIUM
MUNZ & KECK, 1973
UCB HERBARIUM
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UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
MUNZ & KECK, 1973
MUNZ & KECK, 1973
UCB HERBARIUM

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. GRACIFOLIA ENGELM.

SEE: CUSCUTA CALIFORNICA H. & A.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. LONGILOBA ENGELM.

SEE: CUSCUTA CALIFORNICA H. & A.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. PAPILLOSA YUNCKE

ERIODICTYON TRICHCALYX HELLER.

ERIOGONUM FASCICULATUM BENTH.

HYMENOCLEA SALSOLA T. & G.

PAROSELA SPINOSA HEL.

UCR HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. SQUAMIGERA ENGELM.

SEE: CUSCUTA SALINA ENGELM.

CUSCUTA CAMPESTRIS YUNCKER

SEE: CUSCUTA PENTAGONA ENGELM.

CUSCUTA CEANOETHI BEHR.

SEE: CUSCUTA SUBINCLUSA DUR. & HILG.

CUSCUTA DECIPIENS YUNCKER

DYSSODIA PENTACHAETA (DC.) ROBINSON

STROTHERIA GYPSOPHILA B. TURNER

UCB HERBARIUM
UCB HERBARIUM

CUSCUTA DECORA ENGELM.

SEE: CUSCUTA INDECORA CHOISY

CUSCUTA DENTICULATA ENGELM.

ATRIPLEX SP.

CHRYSOETHAMNUS PANICULATUS (GRAY) HALL.

COLEOGYNE RAMOSISSIMA TORR.

COVILLEA SP.

HAPLOPAPPUS SP.

HYMENOCLEA SP.

HYMENOCLEA SALSOLA T. & G.

LARREA SP.

LEPIDOSPARTUM SQUAMATUM (GRAY) GRAY

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

MUNZ & KECK, 1973

MUNZ & KECK, 1973

UCR HERBARIUM

MUNZ & KECK, 1973

UCB HERBARIUM

CUSCUTA EPITHYMUM MURR.

SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA GLANDULOSA SMALL.

SEE: CUSCUTA OBTUSIFLORA HBK. VAR. GLANDULOSA ENGELM.

CUSCUTA HOWELLIANA RUBTZOFF

ERYNGIUM ALISMIFOLIUM GREENE

UCB HERBARIUM

CUSCUTA INDECORA CHOISY

AMBROSIA SP.

AMBROSIA PSILOSTACHYA DC.

ARTEMISIA SP.

ASCLEPIAS SP.

ASTER SP.

ASTER ANDERSONII GRAY

CEANOETHUS CORDULATUS KELL.

CENTAUREA MELITENSIS L.

CENTROMADIA PUNGENS (T. & G.) GREENE

CHENOPODIUM SP.

JUNCUS NEVADENSIS WATS.

LOTUS SP.

LOTUS PURSHIANUS (BENTH.) CLEM. & CLEM.

LYCOPERSICON ESCULENTUM MILL.

MEDICAGO SATIVA L.

NAMA SP.

MUNZ & KECK, 1973

UCR HERBARIUM

MUNZ & KECK, 1973

MUNZ & KECK, 1973

MUNZ & KECK, 1973

UCB HERBARIUM

UCB HERBARIUM

UCR HERBARIUM

UCB HERBARIUM

ASHTON & SANTANA, 1976

UCB HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

CDFA PLANT PATHOLOGY

ASHTON & SANTANA, 1976

UCB HERBARIUM

CUSCUTA INDECORA CHOISY- *continued*

OLEA EUROPAEA L.
 PLAGIOBOTHRY'S SP.
 PORTERELLA CARNOSULA (H. & A.) TORR.
 RHAMNUS SP.
 SALSOLA SP.
 SOLIDAGO CONFINIS GRAY

CDFA BULLETIN (1936) 25:213-215
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 ASHTON & SANTANA, 1976
 UCR HERBARIUM

CUSCUTA INDECORA CHOISY VAR. INDECORA
 CEANOTHUS DIVERSIFOLIUS KELL.
 TRIFOLIUM SP.

UCB HERBARIUM
 HANSEN, 1923

CUSCUTA INDECORA CHOISY VAR. NEUROPETALA (ENGELM.) HITCH.

AMBROSIA SP.
 ARTEMISIA SP.
 ASCLEPIAS SP.
 ASTER SP.
 MEDICAGO SATIVA L.

MUNZ & KECK, 1973
 MUNZ & KECK, 1973
 MUNZ & KECK, 1973
 MUNZ & KECK, 1973
 MUNZ & KECK, 1973

CUSCUTA JEPSONII YUNCK.

SEE: CUSCUTA INDECORA CHOISY VAR. INDECORA

CUSCUTA NEVADENSIS JTN.

ATRIPLEX SP.
 ATRIPLEX CONFERTIFOLIA (TORR. & FREM.) WATS.
 SUAEDA TORREYANA WATS.

MUNZ, 1974
 UCB HERBARIUM
 UCR HERBARIUM

CUSCUTA OBTUSIFLORA HBK. VAR. GLANDULOSA ENGELM.
 POLYGONUM SP.

MUNZ & KECK, 1973

CUSCUTA OCCIDENTALIS MILLSPAUGH

SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA PENTAGONA ENGELM.

ALLIUM SP.
 AMBROSIA SP.
 AMBROSIA CHAMISSONIS (LESS.) E. GREENE
 ASPARAGUS OFFICINALIS L.
 ASTERACEAE
 AVENA SP.

ASHTON & SANTANA, 1976
 UCR HERBARIUM
 UCB HERBARIUM
 ASHTON & SANTANA, 1976
 MUNZ, 1974
 UCR HERBARIUM

CUSCUTA PENTAGONA ENGELM. - *continued*

BACCHARIS GLUTINOSA PERS.

BETA VULGARIS L.

CARTHAMUS TINCTORIUS L.

CHENOPODIUM SP.

CHENOPODIUM ALBUM L.

CONVOLVULUS SP.

CONVOLVULUS ARVENSIS L.

CUCUMIS MELO L. VAR. HONEYDEW

CUCURBITACEAE

DICHONDRA MICRANTHA URB.

FRANSERIA BIPINNATIFIDA KITT.

HEDERA HELIX L.

HELIANTHUS SP.

HELIANTHUS ANNUUS L.

LOTUS PURSHIANUS (BENTH.) CLM. & CLM. VAR. GLABER (NUTT.) MUNZ

LYCOPERSICON ESCULENTUM MILL.

MALVA SP.

MALVA PARVIFLORA L.

MEDICAGO SATIVA L.

MYRIOPHYLLUM SIBIRICUM VAR. EXALBESCENS JEPS.

PHYTOLACCA AMERICANA L.

POLYGONUM SP.

POLYGONUM AVICULARE L.

SENECIO HYDROPHILUS NUTT.

SIDA HEDERACEA (DOUG.) TORR.

TRIFOLIUM SP.

TRIFOLIUM REPENS L.

VICIA SATIVA L. SUBSP. SATIVA

XANTHIUM SP.

XANTHIUM STRUMARIUM L. VAR. CANADENSE (MILL.) T. & G.

CUSCUTA PENTAGONA VAR. CALYCINA ENGELM.

SEE: CUSCUTA PENTAGONA ENGELM.

CUSCUTA PLANIFLORA MUNZ

SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA PULCHERRIMA SCHEELE.

SEE: CUSCUTA INDECORA CHOISY

UCR HERBARIUM

ASHTON & SANTANA, 1976

CDFA PLANT PATHOLOGY

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

UCB HERBARIUM

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

CDFA PLANT PATHOLOGY

UCB HERBARIUM

CDFA PLANT PATHOLOGY

UCB HERBARIUM

UCR HERBARIUM

UCB HERBARIUM

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

CDFA BOTANY HERBARIUM

PLANT DISEASE REPORTER (1965)49:1002-1003

ASHTON & SANTANA, 1976

ASHTON & SANTANA, 1976

UCB HERBARIUM

ASHTON & SANTANA, 1976

MUNZ & KECK, 1973

ASHTON & SANTANA, 1976

UCB HERBARIUM

MUNZ, 1974

UCR HERBARIUM

CUSCUTA RACEMOSA VAR. CHILIANA ENGELM.

SEE: CUSCUTA INDECORA CHOISY VAR. INDECORA

CUSCUTA SALINA APODA YUNCK.

SEE: CUSCUTA NEVADENSIS JTN.

CUSCUTA SALINA ENGELM.

ALLENROLFEA OCCIDENTALIS (S. WATS.) KUNTZE

ATRIPLEX CONFERTIFOLIA. (TORR. & FREM.) WATS

CHENOPODIUM SP.

CRESSA SP.

FRANKENIA SP.

FRANKENIA GRANDIFOLIA CHAM. & SCHECT. VAR. CAMPESTRIS GRAY

HAPLOPAPPUS SP.

JAUMAEA CARNOSA (LESS.) GRAY

SALICORNIA VIRGINICA L.

SUAEDA SP.

CUSCUTA SALINA ENGELM. VAR. MAJOR YUNCKER

BASSIA SP.

FRANKENIA GRANDIFOLIA CHAM. & SCHECT.

HEMIZONIA PARRYI GREENE

SALICORNIA SP.

SALICORNIA VIRGINICA L.

CUSCUTA SALINA ENGELM. VAR. SQUAMIGERA YUNCK.

SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SQUAMIGERA PIPER

SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SQUAMIGERA PIPER VAR. SQUAMIGERA YUNCK.

SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SUAVEOLENS SER.

SEE: CUSCUTA INDECORA CHOISY VAR. INDECORA

CUSCUTA SUBINCLUSA DUR. & HILG.

ABELIA GRANDIFLORA REHD.

ACER MACROPHYLLUM PURSH

ACHILLEA MILLEFOLIUM L.

UCB HERBARIUM

UCB HERBARIUM

MUNZ, 1974

MUNZ, 1974

AMERICAN J. BOT. (1984) 71:157

UCB HERBARIUM

UCB HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

UCB HERBARIUM

ASHTON & SANTANA, 1976

UCB HERBARIUM

CDFA PLANT PATHOLOGY

UCB HERBARIUM

UCB HERBARIUM

LUPINUS SP.

CUSCUTA SUBINCLUSA DUR. & HILG. - *continued*

MONARDELLA VILLOSA BENTH.
 NICOTIANA SP.
 PETUNIA HYBRIDA VILM.
 PLUCHEA SERICEA (NUTT.) COV.
 PONCIRUS TRIFOLIATA (L.) RAF. X CITRUS SINENSIS (L.) OSBECK
 PRUNUS SP.
 PRUNUS ILICIFOLIA (NUTT.) WALP.
 PRUNUS VIRGINIANA L. VAR. DEMISSA NUTT.) TORR.
 PSORALEA PHYSODES DOUGL. EX HOOK.
 QUERCUS SP.
 QUERCUS KELLOGGII NEWB.
 QUERCUS WISLIZENII A. DC.
 RHODODENDRON OCCIDENTALE (TORR. & A. GRAY) A. GRAY
 RHUS SP.
 RHUS DIVERSILOBA TORR. & A. GRAY
 RHUS LAURINA NUTT.
 RHUS OVATA WATS.
 ROSA SP.
 ROSA CALIFORNICA CHAM. & SCHLECTEND
 SALIX SP.
 SALIX BREWERI BEBB
 SALIX GOODDINGII BALL.
 SALIX HINSIANA BENTH.
 SALIX LASIOLEPIS BENTH.
 SALVIA SONOMENSIS GREENE
 SAMBUCUS SP.
 SAMBUCUS CAERULEA RAF.
 SCHINUS MOLLE L.
 SYMPHORICARPOS ALBUS (L.) S.F. BLAKE
 UMBELLULARIA CALIFORNICA (H. & A.) NUTT.
 VIGNA UNGUICULATA (L.) WALP.
 VINCA MINOR L.

UCB HERBARIUM
 PHYTOPATHOLOGY (1949) 39:562-567
 PLANT DISEASE REPORTER (1967) 51:868-871
 UCB HERBARIUM
 PLANT DISEASE REPORTER (1967) 51:629
 ASHTON & SANTANA, 1976
 EL ALISO (1978) 9:197-278
 UCB HERBARIUM
 UCB HERBARIUM
 ASHTON & SANTANA, 1976
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 ASHTON & SANTANA, 1976
 UCB HERBARIUM
 EL ALISO (1978) 9:197-278
 UCR HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 ASHTON & SANTANA, 1976
 UCB HERBARIUM
 USDA #165
 UCB HERBARIUM
 UCB HERBARIUM
 PLANT DISEASE REPORTER (1967) 51:629
 PLANT DISEASE REPORTER (1967) 51:629

CUSCUTA SUBINCLUSA DUR. & HILG. VAR. ABBREVIATA ENGELM.

SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SUKSDORFII YUNCK.

SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA SUKSDORFII YUNCK. VAR. SUBPEDICELLATA YUNCK.
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA TRIFOLII BAB.
SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA URCEOLATA KUNZE.
SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA VEATCHII APODA YUNCK.
SEE: CUSCUTA NEVADENSIS JTN.

CUSCUTA VEATCHII BRANDEGEE
SEE: CUSCUTA DENTICULATA ENGELM.

KOPSIOPSIS STOBILACEA GRAY
SEE: BOSCHNIAKIA STOBILACEA GRAY

KOPSIOPSIS TUBEROSA G. BECK
SEE: BOSCHNIAKIA HOOKERI WALP.

MYCORRHIZA CALIFORNICA (CHAM. & SCHLDL.) RYDB.
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL.

MYCORRHIZA CORYMBOSA RYDB.
SEE: OROBANCHE CORYMBOSA (RYDB.) FERRIS

MYCORRHIZA GRAYANA G. BECK
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (BECK) HECK.

MYCORRHIZA VIOLACEA (EASTW.) JEPSON
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA

OROBANCHE SP.
ARTEMISIA DRACUNCULUS L.
ARTEMISIA TRIDENTATA NUTT.
ERIODICTYON CRASSIFOLIUM BENTH.
UCR HERBARIUM
UCR HERBARIUM
UCR HERBARIUM

OROBANCHE BULBOSA (GRAY) BECK.
ADENOSTOMA FASCICULATUM H. & A.
ARCTOSTAPHYLOS GLAUCA LINDL.
EL ALISO (1978) 9:197-278
UCR HERBARIUM

OROBANCHE CALIFORNICA CHAM. & SCHLIDL.
ARTEMISIA TRIDENTATA NUTT.

ASTER SP.

COMPOSITAE

ERIGERON SP.

ERIOGONUM SP.

ERIOPHYLLUM STAECHADIFOLIUM VAR. ARTEMISIAEFOLIUM

GRAMINAE

HAPLOPAPPUS LINEARIFOLIUS DC.

OROBANCHE CALIFORNICA CHAM. & SCHLIDL. SSP. CALIFORNICA

FRAGARIA SP.

GRINDELIA STRICTA DC. SSP. VENULOSA (JEPSON) KECK

HETEROTHECA GRANDIFLORA NUTT.

OROBANCHE CALIFORNICA CHAM. & SCHLIDL. SSP. CONDENSA HECK.

CHRYSOPSIS VILLOSA (PURSH) NUTT.

OROBANCHE CALIFORNICA CHAM. & SCHLIDL. SSP. FEUDGEI (MUNZ) HECK

ARTEMISIA TRIDENTATA NUTT.

ERIODICTYON SP.

ERIOGONUM SP.

OROBANCHE CALIFORNICA CHAM. & SCHLIDL. SSP. GRANDIS HECKARD

ADENOSTOMA SP.

ADENOSTOMA FASCICULATUM H. & A.

ARTEMISIA SP.

HAPLOPAPPUS VENETUS (HBK.) BLAKE VAR. VERNONOIDES (NUTT.) HALL

HETEROTHECA SP.

OROBANCHE CALIFORNICA CHAM. & SCHLIDL. SSP. GRAYANA (G. BECK) HECKARD

ASTER SP.

ERIGERON SP.

OROBANCHE CALIFORNICA CHAM. & SCHLIDL. SSP. JEPSONII (MUNZ) HECKARD

BACCHARIS VIMINEA DC.

CHAENACTIS SP.

CHRYSOTHAMNUS SP.

GRINDELIA SP.

RUBUS VITIFOLIUS CHAM. & SCHLECTEND

UCR HERBARIUM

MADRONO (1973) 22:41-70

MUNZ & KECK, 1973

MADRONO (1973) 22:41-70

UCR HERBARIUM

UCB HERBARIUM

MADRONO (1973) 22:41-70

UCR HERBARIUM

UCR HERBARIUM

UCB HERBARIUM

CDFA PLANT PATHOLOGY

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

MUNZ, 1974

MUNZ, 1974

MUNZ, 1974

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

HICKMAN, 1993

HICKMAN, 1993

MADRONO (1973) 22:41-70

UCB HERBARIUM

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

OROBANCHE CALIFORNICA CHAM. & SCHLDL. VAR. CALIFORNICA MUNZ.

SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE CALIFORNICA CHAM. & SCHLDL. VAR. CLAREMONTENSIS MUNZ

SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE CALIFORNICA CHAM. & SCHLDL. VAR. CORYMBOSA (RYDB.) M

SEE: OROBANCHE CORYMBOSA (RYDB.) FERRIS

OROBANCHE CALIFORNICA CHAM. & SCHLDL. VAR. PARISHII JEPSON

SEE: OROBANCHE PARISHII (JEPSON) HECKARD SSP. PARISHII HECKARD

OROBANCHE COMOSA HOOK.

SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (BECK) HECKARD

OROBANCHE COMOSA HOOK. VAR. VALLICOLA JEPSON

SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE COMOSA VAR. VIOLACEA (EASTW.) JEPSON

SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA

OROBANCHE COOPERI (GRAY) HELLER

ABRONIA SP.

ACHYRONYCHIA COOPERI T. & G.

AMBROSIA DUMOSA (A. GRAY) PAYNE

BAILEYA PLENIRADIATA HARV. & GRAY

CAMISSONIA CLAVIFORMIS (TORR. & FREM.) RAVEN

COLDENIA PPLICATA (TORR.) COVILLE

DALEA SCHOTTII TORR.

ENCELIA FARINOSA GRAY

HILARIA RIGIDA (THURB.) BENTH. EX SCRIBN.

HYMENOCLEA SP.

HYMENOCLEA SALSOLA T. & G.

LARREA SP.

LARREA MEXICANA MORIC.

LYCOPERSICON ESCULENTUM MILL.

MALVA SP.

OENOTHERA SP.

PALAFIOXIA LINEARIS (CAV.) LAG.

PARKINSONIA ACULEATA L.

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

PHYTOPATHOLOGY (1957) 47:518

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

PHYTOPATHOLOGY (1957) 47:518

UCR HERBARIUM

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UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

OROBANCHE COOPERI (GRAY) HELLER - *continued*
 PARKINSONIA FLORIDA. (BENTH. EX A. GRAY) S. WATS
 PHACELIA CRENULATA TORR. EX S. WATS.
 SAMBUCUS CAERULEA RAF.

OROBANCHE CORYMBOSA (RYDB.) FERRIS
 ARTEMISIA TRIDENTATA NUTT.
 ARTEMISIA SP.

OROBANCHE FASCICULATA NUTT.
 ACER MACROPHYLLUM PURSH
 ADENOSTOMA FASCICULATUM H. & A.
 ARCTOSTAPHYLOS SP.
 ARTEMISIA SP.
 ARTEMISIA ARBUSCULA NUTT.
 ARTEMISIA NOVA A. NELS.
 ARTEMISIA TRIDENTATA NUTT.
 ARTOSTAPHYLOS NEVADENSIS A. GRAY
 CERCOCARPUM SP.
 ERIODICTYON SP.
 ERIODICTYON CALIFORNICUM (H. & A.) TORR.
 ERIODICTYON CRASSIFOLIUM BENTH.
 ERIODICTYON TRICHOCALYX HELLER.
 ERIOGONUM SP.
 ERIOGONUM FASCICULATUM BENTH.
 ERIOGONUM INCANUM T. & G.
 ERIOGONUM NUDUM (DOUGL. EX BENTH.) S. STOKES
 ERIOGONUM UMBELLATUM TORR.
 ERIOGONUM WRIGHTII TORR. EX BENTH.
 ERIOPHYLLUM SP.
 GALIUM SP.
 GALIUM BOLANDERI GRAY
 GALIUM PORRIGENS VAR. TENUE DEMP.
 HAPLOPAPPUS LINEARIFOLIUS DC.
 ISOMERIS ARBOREA NUTT. VAR. ARBOREA
 MONARDELLA SP.
 PETUNIA HYBRIDA VILM.
 PHACELIA SP.
 PINUS MONOPHYLLA TORR. & FREM.
 RHUS DIVERSILOBA TORR. & A. GRAY

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 UCR HERBARIUM
 CDFA PLANT PATHOLOGY

MUNZ, 1974
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 UCB HERBARIUM
 MUNZ & KECK, 1973
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 UCR HERBARIUM
 MUNZ & KECK, 1973
 EL ALISO (1978) 9:197-278
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM*
 UCB HERBARIUM
 UCB HERBARIUM*
 CDFA PLANT PATHOLOGY
 UCB HERBARIUM
 UCB HERBARIUM
 UCR HERBARIUM
 UCB HERBARIUM*
 UCB HERBARIUM*
 CDFA PLANT PATHOLOGY
 JEPSON, 1925
 UCB HERBARIUM*
 UCB HERBARIUM

OROBANCHE FASCICULATA NUTT. SSP. FRANCISCANA (ACHEY) COX
SEE: OROBANCHE FASCICULATA NUTT

OROBANCHE FASCICULATA NUTT. SSP. UNIFLOROIDES COX
GALIUM SP.
GALIUM AMBIGUUM WIGHT
GALIUM CALIFORNICUM H. & A.
GALIUM NUTTALLII GRAY

UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM

OROBANCHE FASCICULATA NUTT. VAR. FRANCISCANA D.B. ACHEY
SEE: OROBANCHE FASCICULATA NUTT.

OROBANCHE FASCICULATA NUTT. VAR. LUTEA (PARRY) ACHEY
SEE: OROBANCHE FASCICULATA NUTT.

OROBANCHE FASCICULATA NUTT. VAR. TYPICA ACHEY
ARTEMISIA TRIDENTATA NUTT.

UCB HERBARIUM

OROBANCHE GRAYANA G. BECK
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL.

OROBANCHE GRAYANA G. BECK VAR. FEUDGEI MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. FEUDGEI (MUNZ) HECKARD

OROBANCHE GRAYANA G. BECK VAR. GRAYANA
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (G. BECK) HECKARD

OROBANCHE GRAYANA G. BECK VAR. JEPSONII MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. JEPSONII (MUNZ) HECKARD

OROBANCHE GRAYANA G. BECK VAR. NELSONII MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA HECKARD

OROBANCHE GRAYANA G. BECK VAR. VALLICOLA JEPSON
SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE GRAYANA G. BECK VAR. VIOLACEA (EASTW.) MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA HECKARD

OROBANCHE LUDOVICIANA NUTT. VAR. COOPERI (A. GRAY) G. BECK
SEE: OROBANCHE COOPERI (A. GRAY) HELLER.

OROBANCHE LUDOVICIANA NUTT. VAR. LATILOBA MUNZ
SEE: OROBANCHE COOPERI (A. GRAY) HELLER

MUNZ & KECK, 1973

OROBANCHE LUDOVICIANA NUTT. VAR. VALIDA MUNZ
SEE: OROBANCHE VALIDA JEPSON

OROBANCHE MULTIFLORA NUTT. VAR. ARENOSA (SUKSD.) MUNZ
ARTEMISIA SP.

MUNZ, 1974

OROBANCHE PARISHII (JEPSON) HECKARD SSP. BRACHYLOBA HECKARD
ATRIPLEX CALIFORNICA MOQ. IN DC.
ERIOGONUM LATIFOLIUM SM.
HAPLOPAPPUS SP.
ISOCOMA MENZIESII (HOOK. & ARN.) G. NESOM

MADRONO (1973) 22:41-70
MADRONO (1973) 22:41-70
MADRONO (1973) 22:41-70
HICKMAN, 1993

OROBANCHE PARISHII (JEPSON) HECKARD SSP. PARISHII HECKARD
ADENOSTOMA SP.
ARCTOSTAPHYLOS SP.
CORETHROGYNE SP.
CORETHROGYNE FILAGINIFOLIA (H. & A.) NUTT.
ERIODICTYON SP.
HAPLOPAPPUS SP.
PLUCHEA SERICEA (NUTT.) COV.

MADRONO (1973) 22:41-70
MADRONO (1973) 22:41-70
UCR HERBARIUM
MADRONO (1973) 22:41-70
MADRONO (1973) 22:41-70
MUNZ & KECK, 1973
UCR HERBARIUM

OROBANCHE PINORUM GEYER EX HOOK.
HOLODISCUS SPP.
HOLODISCUS DISCOLOR (PURSH) MAXIM.
PINACEAE

HICKMAN, 1993
UCB HERBARIUM
MUNZ & KECK, 1973

OROBANCHE PORPHYRANTHA G. BECK
SEE: OROBANCHE UNIFLORA L.

OROBANCHE RAMOSA L.
AMARANTHUS SP.
AMARANTHUS RETROFLEXUS L.
CANNABIS SATIVA L.
CAPSELLA BURSA-PASTORIS (L.) MEDIC.
CARTHAMUS TINCTORIUS L.
CHRYSANTHEMUM MORIFOLIUM RAMAT.
CONIUM MACULATUM L.

MUNZ & KECK, 1973
PLANT DISEASE REPORTER (1953) 37:136-137
USDA #165
PLANT DISEASE REPORTER (1953) 37:136-137
CDEA PLANT PATHOLOGY
CDEA PLANT PATHOLOGY
PLANT DISEASE REPORTER (1953) 37:136-137

OROBANCHE RAMOSA L. - *continued*

LACTUCA SATIVA L.
 LYCOPERSICON ESCULENTUM MILL.
 MELILOTUS ALBA MEDIK.
 MELILOTUS INDICA (L.) ALL.
 POLYGONUM PERSICARIA L.
 SAMBUCUS SP.
 SOLANUM SARACHOIDES SENDT. EX MART.
 XANTHIUM SPINOSUM L.
 XANTHIUM STRUMARIUM L. VAR. CANADENSE (MILL.) T. & G.

BARDIN, 1971
 PHYTOPATHOLOGY (1957) 47:537
 CDFa PLANT PATHOLOGY
 CDFa PLANT PATHOLOGY
 CDFa PLANT PATHOLOGY
 CDFa PLANT PATHOLOGY
 CDFa PLANT PATHOLOGY
 PLANT DISEASE REPORTER (1953) 37:136-137
 PLANT DISEASE REPORTER (1953) 37:136-137
 CDFa PLANT PATHOLOGY

OROBANCHE SEDI FERN.

SEE: OROBANCHE UNIFLORA L.

OROBANCHE TUBEROSA HELLER

SEE: OROBANCHE BULBOSA (GRAY) BECK.

OROBANCHE UNIFLORA L.

ADENOSTOMA SP.
 COMPOSITAE
 CRASSULACEAE
 DODECATHEON SP.
 GALIUM ANDREWSII GRAY
 LITHOPHRAGMA SP.
 LITHOPHRAGMA AFFINE A. GRAY
 LITHOPHRAGMA PARVIFLORUM (HOOK.) NUTT. EX TORR. & A. GRAY
 PENSTEMON SP.
 SAXIFRAGA SP.
 SAXIFRAGA CALIFORNICA GREENE
 SAXIFRAGA FALLAX GREENE
 SAXIFRAGA OREGANA HOWELL
 SAXIFRAGACEAE
 SEDUM SP.
 SEDUM LAXUM (BRITTON) BERGER SSP. LATIFOLIUM CLAUSEN
 SEDUM OBTUSATUM GRAY
 SEDUM SPATHULIFOLIUM HOOKER
 SELAGINELLA SP.

UCR HERBARIUM
 MUNZ & KECK, 1973
 MUNZ & KECK, 1973
 UCB HERBARIUM
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 UCR HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 UCB HERBARIUM
 MUNZ, 1974
 UCB HERBARIUM*
 UCB HERBARIUM
 UCB HERBARIUM*
 UCR HERBARIUM
 UCB HERBARIUM

OROBANCHE UNIFLORA L. SSP. OCCIDENTALIS (E. GREENE) FERRIS

SEE: OROBANCHE UNIFLORA L.

OROBANCHE UNIFLORA L. VAR. MINUTA (SUKSD.) ACHEY
SEE: OROBANCHE UNIFLORA L.

OROBANCHE UNIFLORA L. VAR. PURPUREA (HELLER) ACHEY
SEE: OROBANCHE UNIFLORA L.

OROBANCHE UNIFLORA L. VAR. SEDI (SUKSD.) ACHEY
SEE: OROBANCHE UNIFLORA L.

OROBANCHE VALIDA JEPSON

ERIODICTYON SP.

GARRYA FREMONTII TORR.

QUERCUS CHRYSOLEPIS LIEBM.

MUNZ, 1974

MADRONO (1982) 29:95-100

MADRONO (1982) 29:95-100

OROBANCHE VALIDA JEPSON SSP. VALIDA

CHAPARRAL SHRUBS, VARIOUS

HICKMAN, 1993

OROBANCHE VALIDA SSP. HOWELLII HECK. & COLLINS

ERIODICTYON TRICHOCALYX HELLER. VAR. TRICHOCALYX

GARRYA VEATCHII KELL.

MADRONO (1982) 29:95-100

MADRONO (1982) 29:95-100

OROBANCHE VALLICOLA (JEPSON) HECKARD

ARTEMISIA SP.

PYRUS COMMUNIS L.

QUERCUS SP.

QUERCUS AGRIFOLIA NEE

SAMBUCUS SP.

SAMBUCUS CAERULEA RAF.

SYMPHORICARPUS ALBUS (L.) BLAKE VAR. LAEVIGATUS (FERN.) BLAKE

JEPSON, 1925

MADRONO (1973) 22:41-70

MUNZ, 1974

MADRONO (1973) 22:41-70

MADRONO (1973) 22:41-70

CDEA PLANT PATHOLOGY

MADRONO (1973) 22:41-70

PHELIPAEA CALIFORNICA (CHAM. & SCHLDL.) G. DON.

SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL.

PHELIPAEA LUTEA PARRY

SEE: OROBANCHE FASCICULATA NUTT.

PHELIPAEA COMOSA (HOOK.) A. GRAY

SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (BECK) HECKARD

PHOLISMA ARENARIUM NUTT. EX HOOK.

ABRONIA UMBELLATA LAM.

AMBROSIA DUMOSA (A. GRAY) PAYNE

ASTERACEAE (SHRUBBY SPECIES)

CHRYSOETHAMNUS SP.

CHRYSOETHAMNUS NAUSEOSUS GRAVEOLENS (NUTT.) PIPER.

CROTON SP.

ERICAMERIA ERICOIDES (LESS.) H. & A.

ERIODICTYON SP.

ERIODICTYON TOMENTOSUM BENTH.

ERIOGONUM PARVIFOLIUM SM. IN REES.

FRANSERIA SP.

HAPLOPAPPUS SP.

HAPLOPAPPUS ERICOIDES (LESS.) H. & A.

HYMENOCLEA SP.

HYMENOCLEA SALSOLA T. & G.

PHOLISMA SONORAE (A. GRAY) G. YATSKIEVYCH

AMBROSIA SP.

COLDENIA SP.

ERIOGONUM SP.

PLUCHEA SP.

TIQUILIA SP.

PHORADENDRON SP.

PLATANUS RACEMOSA NUTT.

PRUNUS AMERICANA MARSH.

PHORADENDRON BOLLEANUM (SEEM.) EICH. SSP. PAUCIFLORUM (TORR.)

SEE: PHORADENDRON PAUCIFLORUM TORREY

PHORADENDRON BOLLEANUM (SEEM.) EICH. VAR. PAUCIFLORUM (TORR.)

SEE: PHORADENDRON PAUCIFLORUM TORREY

PHORADENDRON BOLLEANUM (SEEMAN) EICHLER SSP. DENSUM (TORR.) WI

SEE: PHORADENDRON DENSUM TREL.

PHORADENDRON BOLLEANUM (SEEMAN) EICHLER VAR. DENSUM (TREL.) FO

SEE: PHORADENDRON DENSUM TREL.

JEPSON, 1925

UCB HERBARIUM

HICKMAN, 1993

MUNZ, 1974

UCB HERBARIUM

HICKMAN, 1993

JEPSON, 1925

MUNZ, 1974

JEPSON, 1925

JEPSON, 1925

MUNZ, 1974

MUNZ, 1974

UCB HERBARIUM

MUNZ, 1974

UCB HERBARIUM

HICKMAN, 1993

MUNZ & KECK, 1973

HICKMAN, 1993

HICKMAN, 1993

HICKMAN, 1993

USDA #165

CDFA PLANT PATHOLOGY

PHORADENDRON CALIFORNICUM NUTT.

- ACACIA SP.
- ACACIA GREGGII GRAY
- CERATONIA SILIQUA L.
- CERCIDIUM SP.
- CONDALIA SP.
- CONDALIA LYCIOIDES GRAY
- CONDALIA SPATHULATA A. GRAY
- DALEA SP.
- LARREA SP.
- LARREA DIVARICATA CAV.
- LARREA MEXICANA MORIC.
- OLNEYA SP.
- OLNEYA TESOTA A. GRAY
- PARKINSONIA SP.
- PARKINSONIA ACULEATA L.
- PARKINSONIA FLORIDA (BENTH. EX A. GRAY) S. WATS.
- PROSOPIS SP.
- PROSOPIS GLANDULOSA TORR. VAR. TORREYANA (L. BENSON) M. JOHNSTON
- PROSOPIS PUBESCENS BENTH.
- TAMARIX GALLICA L.

- MUNZ & KECK, 1973
- MUNZ, 1975
- HORST (WESTCOTT)
- MUNZ & KECK, 1973
- HORST (WESTCOTT)
- MCMINN, 1964
- USDA #165
- HORST (WESTCOTT)
- MUNZ & KECK, 1973
- MCMINN, 1964
- UCR HERBARIUM
- UCR HERBARIUM
- USDA #165
- HORST (WESTCOTT)
- USDA #165
- USDA #165
- MUNZ & KECK, 1973
- CDFA BOTANY HERBARIUM
- UCR HERBARIUM
- MUNZ & KECK, 1973

PHORADENDRON CALIFORNICUM NUTT. VAR. DISTANS TREL.

SEE: PHORADENDRON CALIFORNICUM NUTT.

PHORADENDRON CALIFORNICUM NUTT. VAR. LEUCOCARPUM (TREL.) JEPSO

SEE: PHORADENDRON CALIFORNICUM NUTT.

PHORADENDRON COLORADENSE TREL.

PROSOPIS SP.

MCMINN, 1964

PHORADENDRON DENSUM TREL.

- CUPRESSUS SP.
- CUPRESSUS ARIZONICA GREENE
- CUPRESSUS MACNABIANA A. MURR.
- CUPRESSUS SARGENTII JEPSON
- JUNIPERUS SP.
- JUNIPERUS CALIFORNICA CARRIERE
- JUNIPERUS OCCIDENTALIS HOOK.
- JUNIPERUS OSTEOSPERMA (TORR.) LITTLE

- BEGA, 1978
- USDA #165
- HILGARDIA (1965) 37:115-153
- CDFA BOTANY HERBARIUM
- BEGA, 1978
- CDFA BOTANY HERBARIUM
- CDFA BOTANY HERBARIUM
- MADRONO (1972) 21:395-401

PHORADENDRON DENSUM TREL. - *continued*
PINUS MONOPHYLLA TORR. & FREM.

MCMINN, 1964

PHORADENDRON DENSUM TREL. F. PARISHII TREL.
SEE: PHORADENDRON DENSUM TORR.

PHORADENDRON DENSUM TREL. X PHORADENDRON JUNIPERINUM ENGELM.
JUNIPERUS SP.
JUNIPERUS OSTEOSPERMA (TORR.) LITTLE

UCR HERBARIUM
MADRONO (1972) 21:395-401

PHORADENDRON FLAVESCENS (PURSH) NUTT.
SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON FLAVESCENS (PURSH) NUTT. VAR. MACROPHYLLUM ENGELM
SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON FLAVESCENS (PURSH) NUTT. VAR. VILLOSUM ENGELM.
SEE: PHORADENDRON VILLOSUM (NUTT.) NUTT.

PHORADENDRON JUNIPERINUM A. GRAY
JUNIPERUS SP.
JUNIPERUS OCCIDENTALIS HOOK.
JUNIPERUS OSTEOSPERMA (TORR.) LITTLE

MUNZ, 1974
MADRONO (1972) 21:395-401
MADRONO (1972) 21:395-401

PHORADENDRON JUNIPERINUM ENGELM. EX GRAY SSP. JUNIPERINUM
SEE: PHORADENDRON JUNIPERINUM A. GRAY

PHORADENDRON JUNIPERINUM ENGELM. VAR. LIGATUM (TREL.) FOSB.
SEE: PHORADENDRON JUNIPERINUM A. GRAY

PHORADENDRON JUNIPERINUM SSP. LIBOCEDRI (ENGELM.) WIENS
SEE: PHORADENDRON LIBOCEDRI TORR.

PHORADENDRON JUNIPERINUM VAR. LIBOCEDRI ENGELM.
SEE: PHORADENDRON LIBOCEDRI TORR.

PHORADENDRON LIBOCEDRI (ENGELM.) HOWELL
CALOCEDRUS DECURRENS (TORR.) FLORIN
PHORADENDRON PAUCIFLORUM (TORR.) WIENS (HYPERPARASITISM)

BEGA, 1978
PLANT DISEASE REPORTER (1970) 54:15

PHORADENDRON LIGATUM TREL.

SEE: PHORADENDRON JUNIPERINUM A. GRAY

PHORADENDRON LONGISPICUM TREL.

SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

ACACIA MELANOXYLON R. BR.

ACER SP.

ACER NEGUNDO L.

ACER SACCHARINUM L.

AESULUS CALIFORNICA (SPACH.) NUTT.

ALNUS SP.

ALNUS RHOMBIFOLIA NUTT.

BETULA SP.

CASTANEA SP.

CEANOTHUS CRASSIFOLIUS TORR.

CELTIS SINENSIS PERS.

DIOSPYROS SP.

DIOSPYROS KAKAI L.

FRAXINUS SP.

FRAXINUS DIPETALA H. & A.

FRAXINUS HOLOTRICHA KOEHNE X F. PALLISAE WILMONT 'MORAINE'

FRAXINUS LATIFOLIA BENTH.

FRAXINUS VELUTINA TORR.

FRAXINUS VELUTINA TORR. VAR. GLABRA REHD. 'MODESTO

GLEDITSIA TRIACANTHOS L.

GLEDITSIA TRIACANTHOS L. F. SP. INERMIS (PURSH) C.K. SCHNEID.

JUGLANS SP.

JUGLANS CALIFORNICA WATS.

JUGLANS HINDSII (JEPSON) JEPSON

JUGLANS REGIA L.

OLEA EUROPAEA L. VAR. 'MISSION'

PLATANUS SP.

PLATANUS RACEMOSA NUTT.

POPULUS SP.

POPULUS FREMONTII WATS.

PROSOPIS SP.

PROSOPIS GLANDULOSA TORR. VAR. TORREYANA (L. BENSON) M. JOHNSTON

PRUNUS AMERICANA MARSH.

PLANT DISEASE (1987) 71:533-536

FRENCH, 1989

PLANT DISEASE (1987) 71:533-536

PLANT DISEASE (1987) 71:533-536

HORTSCIENCE (1967) 2:10-11

PLANT DISEASE (1987) 71:533-536

PLANT DISEASE (1987) 71:533-536

CDEA PLANT PATHOLOGY

FRENCH, 1989

UCR HERBARIUM

PLANT DISEASE (1987) 71:533-536

MUNZ & KECK, 1973

PLANT DISEASE REPORTER (1975) 59:258-262

MUNZ & KECK, 1973

MCMINN, 1964

PLANT DISEASE (1987) 71:533-536

USDA #165

PLANT DISEASE (1987) 71:533-536

PLANT DISEASE (1987) 71:533-536

PLANT DISEASE (1987) 71:533-536

JOURNAL OF ARBORICULTURE (1991) 17:127-130

MUNZ & KECK, 1973

EL ALISO (1978) 9:197-278

HILGARDIA (1965) 37:115-153

PLANT DISEASE (1987) 71:533-536

CDEA BOTANY HERBARIUM

MUNZ & KECK, 1973

MADRONO (1972) 21:395-401

FRENCH, 1989

HORTSCIENCE (1967) 2:10-11

MUNZ & KECK, 1973

USDA #165

FRENCH, 1989

PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL - *continued*

- PRUNUS DULCIS (MILL.) D.A. WEBB
 PRUNUS MAHALEB L.
 PRUNUS PERSICA L.
 QUERCUS SP.
 QUERCUS DOUGLASII HOOK. & ARN.
 ROBINIA PSEUDOACACIA L.
 SALIX SP.
 SALIX BABYLONICA L.
 SALIX EXIGUA NUTT.
 SALIX GOODINGII BALL.
 SALIX LAEVIGATA BEBB
 SALIX LASIANDRA BENTH.
 SOPHORA JAPONICA L.
 ULMUS AMERICANA L.
 ULMUS MINOR MILL.
 UMBELLULARIA CALIFORNICA (H. & A.) NUTT.
 ZELKOVA SERRATA MAKINO
- PHORADENDRON PAUCIFLORUM TORR.
- ABIES SP.
 ABIES CONCOLOR (GORD. & GLEND.) LINDL. EX HILDEBR
 CUPRESSUS SP.
 CUPRESSUS MACNABIANA A. MURR.
 CUPRESSUS SARGENTII JEPSON
 PHORADENDRON PAUCIFLORUM TORR. (AUTOPARASITISM)
- PHORADENDRON TOMENTOSUM (DC.) ENG. SSP. MACROPHYLLUM (ENG.) WI
 SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL
- PHORADENDRON TOMENTOSUM SUBSP. VILLOSUM X P. VILLOSUM NUTT.
 PLATANUS RACEMOSA NUTT.
- PHORADENDRON VILLOSUM (NUTT.) NUTT.
 ADENOSTOMA SP.
 AESCULUS CALIFORNICA (SPACH.) NUTT.
 ALNUS SP.
 ALNUS RHOMBIFOLIA NUTT.
 ARCTOSTAPHYLOS SP.
 ARCTOSTAPHYLOS MANZANITA PARRY
- FRENCH, 1989
 FRENCH, 1989
 CDFA BOTANY HERBARIUM
 FRENCH, 1989
 JOURNAL OF ARBORICULTURE (1991) 17:127-130
 PLANT DISEASE REPORTER (1975) 59:258-262
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 PLANT DISEASE REPORTER (1975) 59:258-262
 MCMINN, 1964
 MCMINN, 1964
 CDFA BOTANY HERBARIUM
 PLANT DISEASE REPORTER (1975) 59:258-262
 PLANT DISEASE (1987) 71:533-536
 FRENCH, 1989
 PLANT DISEASE (1987) 71:533-536
 MCMINN, 1964
 PLANT DISEASE (1987) 71:533-536
- MUNZ, 1974
 BEGA, 1978
 MUNZ & KECK, 1973
 CDFA BOTANY HERBARIUM
 EL ALISO (1948) 1:257-321
 PLANT DISEASE REPORTER (1970) 54:15
- MADRONO (1972) 21:395-401
- MCMINN, 1964
 USDA #165
 HORST (WESTCOTT)
 USDA #16
 HORST (WESTCOTT)
 USDA #165

PHORADENDRON VILLOSUM (NUTT.) NUTT. - <i>continued</i>	
ARCTOSTAPHYLOS PATULA GREENE	USDA #165
CASTANEA DENTATA (MARSH.) BORKH.	PLANT DISEASE REPORTER (1976) 60:360
CASTANOPSIS SP.	MCMINN, 1964
FORESTIERA NEOMEXICANA GRAY	USDA #165
FRAXINUS SP.	MCMINN, 1964
PHORADENDRON PAUCIFLORUM TORR. (HYPERPARASITISM)	PLANT DISEASE REPORTER (1970) 54:15
PLATANUS RACEMOSA NUTT.	MADRONO (1972) 21:395-401
POPULUS SP.	MUNZ & KECK, 1973
QUERCUS SP.	EL ALISO (1978) 9:197-278
QUERCUS AGRIFOLIA NEE	PLANT DISEASE REPORTER (1976) 60:360
QUERCUS CHRYSOLEPIS LIEBM.	HEPTING, 1971
QUERCUS DOUGLASII HOOK. & ARN.	USDA #165
QUERCUS GARRYANA DOUGL.	USDA #165
QUERCUS KELLOGGII NEWB.	SCHARPF & HAWKSWORTH, 1974
QUERCUS LOBATA NEE	USDA #165
QUERCUS WISLIZENII A. DC.	USDA #165
QUERCUS WISLIZENII VAR. FRUTESCENS ENGEL.	UCR HERBARIUM
RHUS SP.	MUNZ & KECK, 1973
UMBELLULARIA CALIFORNICA (H. & A.) NUTT.	MUNZ & KECK, 1973
PHORADENDRON VILLOSUM (NUTT.) NUTT. SSP. VILLOSUM WIENS	
SEE: PHORADENDRON VILLOSUM (NUTT.) NUTT.	
PHORADENDRON VILLOSUM VAR. ROTUNDIFOLIUM TREL.	
SEE: PHORADENDRON VILLOSUM (NUTT.) NUTT.	
PILOSTYLES THURBERI GRAY	
PSOROTHAMNUS EMORYI (A. GRAY) RYDB.	HICKMAN, 1993
RAZOUMOFSKYA AMERICANUM KUNTZ	
SEE: ARCEUTHOBium AMERICANUM NUTT. EX ENGELM. IN GRAY	
RAZOUMOFSKYA BLUMERI STANDLEY	
SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY	
RAZOUMOFSKYA CAMPYLOPODA (ENGELM.) KUNTZE	
SEE: ARCEUTHOBium CAMPYLOPODUM ENGELM. IN GRAY	
RAZOUMOFSKYA CYANOCARPA A. NELS. IN RYDBERG	
SEE: ARCEUTHOBium CYANOCARPUM COULT. & NELS.	

RAZOUMOFSKYA DIVARICATA COVILLE

SEE: ARCEUTHOBium DIVARICATUM ENGELM.

RAZOUMOFSKYA DOUGLASII (ENGELM.) KUNTZE

SEE: ARCEUTHOBium DOUGLASII ENGELM.

RAZOUMOFSKYA DOUGLASII TSUGENSIS (ROSENDAHL) PIPER

SEE: ARCEUTHOBium TSUGENSE (ROSENDAHL) G.N. JONES

RAZOUMOFSKYA OCCIDENTALE (ENGELM.) KUNTZE

SEE: ARCEUTHOBium OCCIDENTALE ENGELM.

RAZOUMOFSKYA TSUGENSIS ROSENDAHL

SEE: ARCEUTHOBium TSUGENSE (ROSENDAHL) G. N. JONES

THALESIA PURPUREA HELLER

SEE: OROBANCHE UNIFLORA L. VAR. PURPUREA (HELLER) ACHEY.

VISCUM ALBUM L.

ACER SP.

ACER MACROPHYLLUM PURSH

ACER SACCHARINUM L.

AESCULUS SP.

AESCULUS CALIFORNICA (SPACH.) NUTT.

ALNUS SP.

ALNUS RUBRA BONG.

BETULA SP.

BETULA PENDULA ROTH

CARYA SP.

CASTANEA SP.

CRATAEGUS SP.

CRATAEGUS LAEVIGATA (POIR.) DC.

CRATAEGUS OXYCANTHA L.

DIOSPYROS SP.

DIOSPYROS KAKAI L.

FRAXINUS SP.

FRAXINUS VELUTINA TORR.

JUGLANS HINDSII (JEPSON) JEPSON

MALUS SP.

FLORIBUNDA SIEBOLD EX VAN HOUTTE

HORST (WESTCOTT)

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CDFA PLANT PATHOLOGY

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SYLVESTRIS MILL.
 POPULUS SP.
 POPULUS ALBA VAR. PYRAMIDALIS
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 POPULUS FREMONTII WATS.
 POPULUS NIGRA L. CV. ITALICA MUNCHH.
 POPULUS TREMULOIDES MICHX.
 PRUNUS SP.
 PRUNUS DULCIS (MILL.) D.A. WEBB
 PRUNUS SALICINA LINDL.
 PYRACANTHA SP.
 PYRUS COMMUNIS L.
 ROBINIA SP.
 ROBINIA PSEUDOACACIA L.
 SALIX SP.
 SALIX BABYLONICA L.
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 SALIX LASIANDRA BENTH.
 SORBUS SP.
 SORBUS AUCUPARIA L.
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